The
Electrical Review

VOL. CXXIII JULY 15, 1938. No. 3164

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Classified Advertisements—Official Notices—Tenders—Supp. 13.

Index to Advertisers—Page xi.

Principal Contents:

	PAGE
Waterworks Pumping. By F. Johnstone Taylor	75
A Large Strip Mill	77
What is Ohm's Law? By D. J. Pearce	78
High-Pressure Boilers. By V. Walker	79
The I.E.E. Revisits Birmingham	81
Fruit and Bulb Storage	83
Drill Hall Lighting	84
Making Vehicle Batteries	85
Correspondence: Reorganisation of Distribution; Impulse Recording Strips	87
New Apparatus and Devices	89
Electrical Import Trade of India	92
Business and Industrial Notes	93
Electricity Supply	97
Contract Information	100
Notes	101
Our Personal Column	102
Financial Section	103
Published Specifications	107
New Work for Contractors	108

Hire and Hire-purchase

Can contractors assist?

THE modern generation has become accustomed to the hire-purchase principle; not so many years ago indulgence in hire-purchase was regarded as lack of principle. With proper safeguards it may be regarded as a sort of deferred thrift—saving up for something after its acquisition. It is a system which, of course, has been much abused. People have been tempted to go in for articles which were useless to them or which took the place of more essential things. There are, however, directions in which hire-purchase has been a real boon to large numbers of people and to important industries.

Among the latter the electricity supply industry stands out. It is generally agreed that electrical service is now the right of everybody, but to make that service fully available to all involves the provision of a great deal of equipment which though high in first cost can be expected to last until it has more than justified its purchase. Was the supply industry then to wait until the prospective consumer had saved up, first to buy an installation and then a cooker, a water heater, a wash-boiler, fires, a kettle and other appliances? With the example of the gas industry before it such an attitude was seen to be impossible. That industry had already found that people would cling to the coal fire unless the change was made easy for them, and once gas had shown the way electricity suppliers had no option but to follow.

Up to 1926 only a minority of electricity supply undertakings (mainly companies) were able to let out on hire or sell by hire-purchase electric wiring and apparatus. General powers were conferred by the 1926 Act, but undertakings were slow to exercise them. A committee set up by the Electricity Commissioners to investigate the subject reported in 1930 that 230 out of about 650 undertakings had no sort of scheme at all; of the others, 213 gave facilities for assisted wiring, 304 for the hire and/or hire-purchase of apparatus, and 187 for both.

The Committee recommended that all authorised undertakings should be urged to use their powers of providing installations and apparatus, and suggested financing methods. Incidentally, it proposed that electricity suppliers should operate such schemes in conjunction with the electrical contractors and manufacturers and have the assistance on the propaganda side (which was recognised as most important) of the British Electrical Development Association.

The Commissioners have since done much to encourage assisted wiring and hire and hire-purchase, and as a result schemes have been instituted by an increasing number of undertakings. Exact figures are hard to obtain, but it is obvious from the returns received by E.D.A. from its members that most undertakings are now doing something in the matter. In 1936-37 the Commissioners sanctioned the borrowing of £1,867,000 for the purpose.

What part have the contractors (co-operation with whom was recommended by the before-mentioned committee) played in this direction? We fear that it has hardly been commensurate with their numbers and importance, due partly to themselves, but perhaps more to the stand-offish attitude taken up by a large number of supply authorities. The contractors have never been able (nor have they been encouraged) to provide hire-purchase schemes and the necessary "service" on a scale adequate to meet the need; and in their case the operation of simple hire schemes was hardly practicable.

They now have to face the fact that the business is in the hands of the supply authorities, and they can only hope to deal with the cash buyer or persuade the supply authorities to accept them as part of the organisation for obtaining business, at a suitable remuneration, and as the installers of wiring and apparatus. Such an arrangement exists in some areas; why should not all supply undertakings utilise the services of a body of men who know their job and are in close touch with the public?

This appears to be one of the questions which must be considered in the drafting of the long-awaited Distribution Bill. Is anything effective being done about it?

Trolley-buses in Manchester

OF particular significance in view of the Manchester City Council's decision gradually to replace its tramways by either motor-buses or trolley-buses, leaving the choice open for each route conversion, are the operating results of the city's initial trolley-bus services. The system was inaugurated along the Ashton Old Road route on March 1st and was added to later in the month by the conversion of the Fairfield-Chorlton tram service, so that the period covered by the 1937-38 annual report of Mr. R. Stuart Pilcher, the general manager of the Corporation's Transport Department, is too short to provide an accurate indication of results during a complete year. Nevertheless, it is interesting to observe that the working expenses amounted to only 71 per cent. of the traffic receipts, compared with 88 per cent. in the case of trams and 81 per cent. for buses, the last two being, of course, over the whole year. Novelty was one of the reasons, no doubt, for the high average traffic revenue per bus mile (18.364d.), but experience in London has shown that the popularity of the trolley-bus is not transitory. Thus, in the last annual report of the L.P.T.B. it was shown that the level of receipts per vehicle-mile had not only been maintained but had actually shown an advance of 4 per cent.

The Cost of Research

WORK on the building of the new physics laboratory at Oxford University has begun. The building is expected to cost over £70,000—a large sum, but there are good reasons for it, as will be gathered from the reference made in this issue to the elaborate precautions that must be taken in order to ensure the fine accuracy essential in modern fundamental research. Moreover, it is not only a question of producing the best design for present conditions, but also of devising an initial scheme that shall be sufficiently flexible to provide for developments in the future which cannot, of course, be foreseen. This is not by any means all that is necessary, however, in order to ensure the continuance of research on an adequate scale. More money will be needed later both to acquire new apparatus, as circumstances may require, and—what is of still greater importance—to retain the men of the calibre necessary to make the best use of it.

Electricity Passed On

AN unusual method of illegally obtaining electricity was revealed in a prosecution at Manchester last week. A man who had had his supply cut off was found to be carrying on a battery-charging business as usual. Inspection showed that the supply was coming from a house several doors away by means of wires through the roofs of intervening houses. The prosecution appears to have relied upon the difference in the price per kWh which the defendant should have paid (3¼d.) and that paid by his unauthorised supplier (½d.). If the supplier's rate had been 3¾d., would there still have been ground for action, apart from the possibility of endangering the supply to other consumers?

Trouble and Achievement

Two interesting reports recently received from overseas are those of the South African Electricity Supply Commission and the Electrical Department of the Federated Malay States, both of which tell of abnormal development under difficult conditions. In South Africa the electrical energy sales of 2,535 million kWh were more than twice as much as two years previously. This exceptional demand was met under some of the worst conditions ever experienced. One violent storm resulted in the flooding of the Congella power station, on which more than eleven inches of rain fell in two hours, and another caused trouble at the Salt River station, in addition to which a number of mishaps occurred to the Commission's plant when this could least be spared. In the F.M.S. the amount of electricity sold last year was 521 million kWh, compared with 298 million kWh two years before, and an even greater advance would have been recorded had the Department been able to meet all the demands made upon it. The task of maintaining the supply over the network of over 400 miles of mains, parts of which pass through wild jungle, is hedged about with difficulties. "Outages" through line faults have, however, been reduced to the minimum by the establishment of quarters equipped with telephones at all switching points, although switchmen are said to be not over-anxious to occupy these posts. There are reasons for this: one switchman watched with apprehension a herd of elephants file past his house along the path of the transmission line. Luckily they were in good temper and only pushed a number of poles a little out of the vertical. Less easy to discover is the damage done by white ants that eat through steel-armoured cables buried underground. Fortunately there is a remedy, for it has been found that these termites will not attack brass.

Rewiring and Inspection

FIRES due to unknown causes are sometimes attributed to electricity, as the chairman of the Liverpool and London and Globe Insurance Co. has recently admitted. Nevertheless, in suggesting that many installations from twenty-five to thirty years old should be periodically overhauled, Mr. A. E. Pattinson is surely not asking too much. We would go further and say that inspection would reveal that most of them ought to be completely rewired. We would also ask whether the insurance companies themselves have done all that they might to ensure that the millions of installations connected during the last few years comply with the I.E.E. Regulations and are generally in accordance with the best modern practice.

The Letter of the Law

IN course of time natural laws tend to be simplified in expression for convenience of application to the more usual practical problems. Since "use is the judge, the law and rule of speech," they may thus acquire a commonly understood meaning that fails to account for all that is implied in the original deductions upon which empirical formulæ are based. Thus, Ohm's Law is stated as $C=E/R$, or some variant of the equation, but this is by no means of universal application. The chief merit of Ohm's researches, as Mr. D. J. Pearce shows in this issue, lay in demonstrating the relationship between voltage and current in a conductor, and not in defining "resistance," with which his name is classically associated.

Engineering Education

IT is customary for the summer school for teachers in technical colleges and schools organised by the Board of Education to take place in an academic environment—Oxford, for instance. It is, therefore, a noteworthy tribute to the Metropolitan-Vickers Co. that this year the course should have been held at its Trafford Park works. For many years now the company has pursued a most liberal policy of industrial and technical education, and has thereby made a substantial contribution to the raising of the standard of entrants into the engineering industry. For this Dr. A. P. M. Fleming has been largely responsible, and we take his election as president of the I.E.E. to be recognition of the valuable work which he has done.

Harmony in Industry

THE idea of dispensing music from loud-speakers to aid factory production seems to be spreading; we visited another works this week in which the system is in vogue. We imagine that some difficulty may be experienced in the choice of programmes. Modern dance band music is, no doubt, the most popular, but we visualise dire results upon the progress of the work if a Bach or Beethoven lover is in a key position in an assembly line when the loud-speakers belch forth some of the cacophonous rhythms which pass for music nowadays. Conversely, those who like such stuff might be disorganised by classic compositions. How are these clashes of tempo and temperament got over we wonder?

Waterworks Pumping

By F. Johnstone Taylor

Examples of Modern Installations

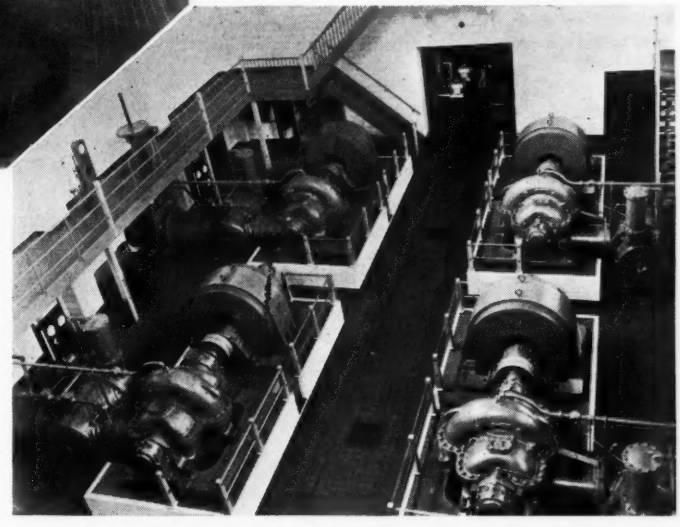
Experience in the U.S.A. shows that a considerable saving can be effected by substituting mains-driven electric pumping plant for self-contained steam sets. Supervisory systems of control are greatly simplifying operation

MANY engineers regret the passing of the triple-expansion pumping engine, but when an electrically driven set can be installed for about £15 or less per h.p., as compared with £45 to £50 which has to be paid for the steam set of comparable power, the fact that its power costs may be greater than the fuel costs of the steam engine is no argument in favour of the latter. The principal one against electrically operated sets of this class which may be handling 20 million gals. or so a day against heads of 300 to 400 ft. (calling for between 1,000 and 2,000 h.p., which is large as pumping units go) is the risk of power failure in such vital services as waterworks and drainage pumping. In the latter case, however, when operation is intermittent the standby losses are transferred to the supply concerns and the risk of power failure may be held normally to be almost negligible.

At the Cermak pumping station of the Chicago waterworks the plant comprises six 1,500-h.p. units pumping 50 million gals. per day against a 136-ft. head. The 2,300-V synchronous motors run at 514 r.p.m. and require only the very simplest type of buildings and foundations. The maximum amount

of capital can thus be put into machinery and equipment that enables the plant to be practically automatic in its operation, and requires only six or seven men to operate it continuously over three shifts.

At a larger plant at Pittsburgh, known as the Brilliant station, there are four 720-r.p.m. units of 2,500 h.p. and two of 1,500 h.p. operated by a total staff of ten, including those required for the remote control of subsidiary stations. The cost of this plant was £155,000 or £13 per h.p. installed; the operating costs average some £42,000 per annum of which energy at 0.326d. per kWh accounts for £35,000, while labour, maintenance and incidentals amount to £7,000 for an average daily pumpage of nearly 65 million gals.



Above: Single-stage pumps delivering up to 20 million gallons per day. Right: 1,500-h.p. pumping units at Cermak pumping station, Chicago

Energy is purchased at the supply company's standard rate for industrial service with normal "on-peak" demands of 2,880 kVA and "off-peak" demands of 3,360 to 4,520 kVA at net rates of 0.355d. to 0.335d. per kWh with a monthly consumption of 1,800,000 to 2,280,000 kWh. The saving over the steam plant which it replaces is stated to be £14,500 per annum and the fixed charges on the plant of £9,000 are more than paid for in direct operating cost.

Two single-stage pumps are operated in series to pump against heads up to 326 ft., a value not often exceeded in waterworks practice. Excitation at 220 V is provided by two motor-generators, the 75-h.p induction motors of which are wound for 2,300 V. These sets also furnish d.c. for cranes. The operator can start and stop the pump motors and control the field current from a control desk centrally located on the balcony of the main pump room adjoining the switchroom. The sequence of the motor starting is governed automatically by a system of relays, which at predetermined times by-pass the reactors and close the field switch.

The starting peak of the larger motor is only 4,100 kVA, although the starting torque is one half of the full-load torque. Parts of all units are interchangeable and one of the larger sets has extra impellers to be changed to meet seasonal variations in its pumping conditions. Each one, too, is connected to the rising mains through an automatic cone valve and motor-operated gate valves.

The cone valves are of the same type as those at the Cermak station and are near the pumps which are illustrated. They close automatically with the stoppage of the pumps, though they, in common with the other valves, can be operated at any time from the control desk by a solenoid valve controlling the admission of pressure to a hydraulic-operating cylinder. The main feature of the construction of these cone valves, which is that of the familiar plug cock, is that they perform the function of a reflux valve.

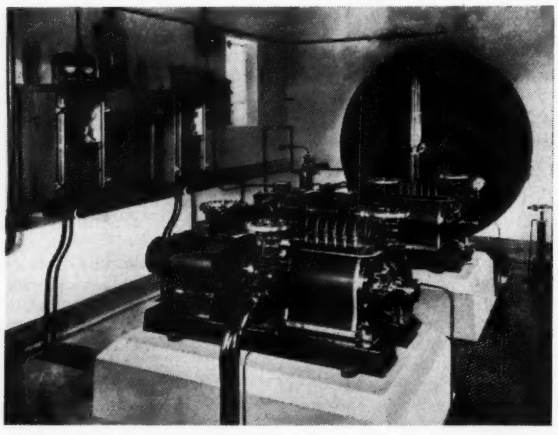
Backflow in the case of high-head pumping through long lines of rising main can provide the designer with a major problem. Conditions usually rule out the simple flap type of reflux valve while demanding one which, though giving good hydraulic conditions of flow in the open position will effectively prevent backflow through the pump and its possible reversal without setting up shock.

In the present case the valve remains closed till the pump has built up enough pressure to cause it to open. It remains so until the pump stops, when it closes at a rate adjusted by the attendant who can also alter its degree of opening during running.

Admittedly needle valves are the only ones which permit of efficient throttling, but the arrangement as a whole is rather more costly than the cone valve, which combines a clear waterway in the open position with overall compactness. Opening and closing is effected through a solenoid-controlled hydraulic cylinder. Links in connection with the quarter-turn motion, through the medium of a screw, crack the plug away from its seat by a slight axial movement towards the left, a reverse motion reseating the plug after closure. The smooth waterway obtainable is of further advantage in permitting the valve to be installed on a reduced diameter section of the delivery without adding appreciable hydraulic friction. Thus the overall dimensions can be kept down to the minimum.

Though there would be no appreciable difficulties in operating plants of this class and size entirely unattended the usual policy is to have a small staff, as the proportional cost is relatively low and the staff can exercise supervisory control over subsidiary stations. The pump motors in the latter are controlled by a float switch or by a distant level recorder the pumps in the first instance being started and stopped by the prearranged levels in the suction well and in the second by the level in the reservoir served. Control can be initiated by the pressure in the rising mains, especially in the case of booster pumps installed on gravitational mains at points where

they have become overloaded. Generally the most effective method is to cause the pumps to deliver into a closed steel tank containing air and water under pressure, the air being maintained at a pressure sufficient to ensure water reaching the highest levels of the district served. The air pressure is pumped up as required, usually for about half an hour in a week's working, to replenish that absorbed by the water.



Six-stage booster pumps each lifting 40 g.p.m. against a 90-ft. head driven by 3-h.p., 1,500-r.p.m. motors

Thereafter variation of air pressure indicated on a gauge makes and breaks the contacts starting and stopping the pumps.

In the case of a supervisory system the control equipment is that normally associated with any unattended sub-station. Energy can be supplied by a trickle-charged 48-V battery. A telephone station with an extension, consisting of a transmitter only, is installed, together with a relay that responds when ringing voltage is impressed on the circuit; the latter performs a function similar to that of lifting the receiver and of hanging it up when the call is completed.

When the station is called the apparatus responds in a code system of dots and dashes, sounded by a buzzer located just below the extension transmitter, with a single stroke bell to indicate the termination of each code signal. The first signals sent out concern the electrical apparatus only. If this part of the equipment is in working order, the succeeding indications of faults are omitted. If not, a signal will be given and one or more faults are then coded. The next signal indicates which of the two units in the station has been selected for service. A further signal showing whether the water is influent or effluent with respect to the suction tank is taken from a movable vane in a double-flow Venturi meter through which the water flows to the reservoir. In this reservoir, in a typical instance, a column of mercury balanced against the water level with contacts set into the mercury column at the appropriate intervals indicates the water level, while the discharge pressure is indicated by means of a battery of Mercoid pressure-switches mounted on a manifold connected to the discharge piping.

Underground Pumps

Many of these small plants can be conveniently located wholly underground. In a relatively large one, partly housed underground, owing to the necessity for eliminating noise, the average head is 210 ft., and two of the units have a capacity of 7,150 gals. per minute, and are operated by 400-h.p. synchronous motors while the other two, with a capacity of 10,400 gals. per minute, are driven by suitable 600-h.p. motors.

The total cost of this plant, which is in operation at Baltimore, is given as just under £50,000 for 2,000 h.p. or just under £25 per h.p. installed, which seems to be on the high side.

Moreover, the power supply at 0.432d. per kWh is not exceptionally cheap, so that the operating costs for an average pumpage of 7.7 m.g.d. are £6,500 p.a. This, however, based on capacity, is only about 12 per cent. more than the costs of the much larger station at Pittsburgh and are not unfavourable in view of the intermittent operation and somewhat exceptional duty to which they are subjected.

This duty is one of pumping direct into a distribution system from which the excess flow goes into a high-level reservoir. When the latter has been pumped up, a pressure controller operates a pilot valve through which an hydraulically operated sluice valve is closed. The valve on the pump discharge slowly closes by virtue of the rise of pressure in the distribution system and when approaching closure it operates a limit switch which trips the pump motor. Further pumping is now delayed for a period as set by a timing relay, though if the pressure drops, meanwhile, below the limit of the "low" contact on the pressure relay, this latter will anticipate the timing relay and start the pump.

A subsidiary plant controlled from a main station may be more suitable in certain conditions than one entirely automatic in operation and still not have to be debited with attendance charges. One at Pittsburgh known as the Lincoln station, like the main station, replaces a steam set with a duty of 850 g.p.m. on a 410-ft. head, and is a good example of what may be accomplished by modernisation and of the way in which the entire cost can be paid off in a few years by the economies and saving in labour charges effected.

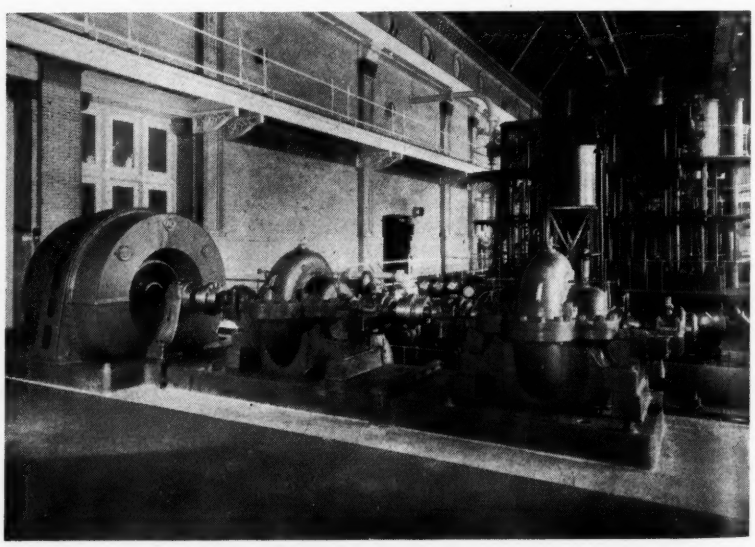
From the Lincoln station a series of a.c. impulses are transmitted which operate a continuously indicating recorder at the main station to register the discharge pressure. The latter closely corresponds with the water level in the tank at the subsidiary plant and serves as a guide to the operator at the main station in starting and stopping the subsidiary one. D.c. impressed on the circuit from the control operates a telephone relay at the unattended plant, thereby starting the pump motor.

Only one of the units at a time is in operation, the other coming into the line automatically should the first one stop due to mechanical or electrical fault. These two sets are driven by 100-h.p. s.c. induction motors at 3,650 r.p.m. The plant includes static condensers for p.f. correction and the cost of power is 0.59d. per kWh.

Continuous Automatic Operation

While certain conditions in both remotely-controlled and fully automatic plants of this kind may call for comprehensive special equipment, for waterworks duty automatic stations can often be arranged for continuous operation, usually as boosters, with two identical pumping units of which only one is in use at a time. Control consists simply of standard motor starters and protection and of a switch for selecting either unit for normal operation. A fault on the selected unit operates its lock-out relay, thereby automatically stopping the faulty one and starting the other. The former cannot be restarted until the lock-out relay has been reset by hand.

In a variation of this type of plant pumping is to a reservoir either directly or through a distribution system. The control equipment is similar, but with additional provision to start and stop the pumps, either based on the reservoir level or the system pressure or a combination of both. Where a direct rising main to the reservoir is available, the static pressure corresponding to its low level and the dynamic pressure corresponding to its high level can be definitely determined and a suitable pressure relay installed to control the pumps. Such a relay, usually provided with diaphragm-operated mercury type switches, can recognise a differential of less than 6 in. of water.



Two 20 by 18 in. centrifugal pumps driven by a 1,200-h.p., 720-r.p.m. synchronous motor at Washington, D.C.

A Large Strip Mill

Electrical demand of 20,000 kVA

BELIEVED to be the largest and fastest of its type in the world, a new 98-in. continuous strip mill at the works of the Republic Steel Corporation, Cleveland, U.S.A., embodies many outstanding improvements in steel-processing equipment, particularly from the electrical viewpoint. The plant is installed on a 182-acre site six miles from the mouth of the Cuyahoga River, its buildings occupying more than twenty acres. The mill can be adapted for a high-speed production of nearly a million tons a year or for relatively small quantities of specially processed steel, with a continuous production flow from unit to unit and from department to department. The maximum delivery speed of the hot section is 2,121 ft. per min., rolling finished widths from 30 to 94 inches, and finished thicknesses from 18-gauge strip to half-inch plate.

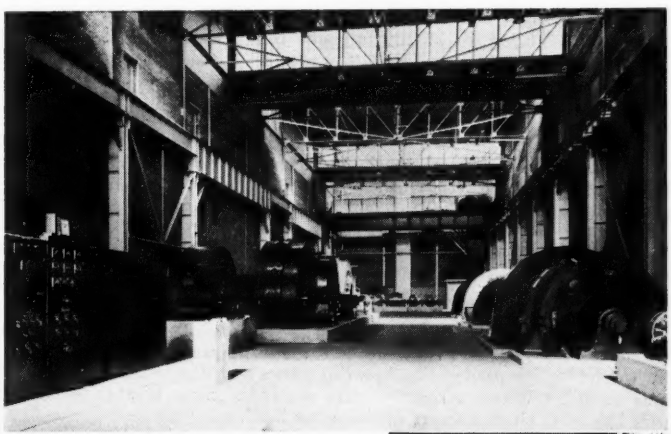
The electrical demand of the entire mill is 20,000 kVA and from an 11-kV supply power is delivered to the various motors at 2,300, 600, 440 and 250 V. Electricity for the hot finishing stands and the cold reduction stands is supplied at 600 V d.c., from four 6,000-kW motor-generator sets. For the roughing main drive motors, general service water pumps, spray pumps and air compressors, power is delivered at 23,000 V from a 12,000-kVA transformer bank. The 250-V d.c. supply is obtained from three 1,500-kW generators, and for lighting distribution and auxiliary motors throughout the plant a 3,000-kVA transformer bank reduces the voltage to 440 V. Transformers are of the non-inflammable, non-explosive "Pyranol" type, which makes it possible to install them in the motor room, greatly reducing the cost of interconnections, switchgear and motors.

The main-drive motors for the hot section have a total h.p. of about 40,000. The roughing section main drives, three of which incorporate load-equalising flywheels, have automatically controlled 3,000-h.p., a.c wound-rotor motors with slip regulators. The main drives of the first five finishing stands have 4,500-h.p. variable-speed, shunt-wound d.c. motors with Ward-Leonard control. The last finishing stand is driven by a 3,500-h.p. motor of the same type.

When steel is rolled in all six finishing stands at the same time, the overload on the motors introduces a difficult p.f. correction problem. On no-load the excitation of the synchronous motors must be low, yet sufficient to prevent stalling when the load enters the stand, but when the stands are full maximum excitation is required. Correction is effected automatically as the load changes, resulting in minimum disturbance to the power system, better voltage regulation, and lower power charges.

Altogether, throughout the mill there are 1,420 motors (totalling 123,000 h.p.), varying in size from the 4,500 h.p. finishing-stand motors to the fractional h.p. motors serving the clocks. Twenty-three motors are of 1,000 h.p. or more. Interesting features of the mill are the individual d.c. motor drives of the run-out tables and coilers. Heretofore, it has been standard practice to drive these units with a.c. motors. Their duties are particularly severe, as the rollers must start from rest, accelerate to a high speed, decelerate, stop and reverse in a very short time. These motors are of totally enclosed, shunt-wound, ball-bearing type, units of up to 4.5-h.p. serving the table rollers and others of up to 25 h.p. the coiler rollers. These are Ward-Leonard controlled. The d.c. motors eliminate the very considerable conversion losses of the d.c. to a.c. motor-generator sets, as well as the rotor losses of squirrel-cage motors, and they greatly simplify the control apparatus and save sub-station space. Only two 1,000-kW motor-generator sets are required for the d.c. run-out and coiler motors.

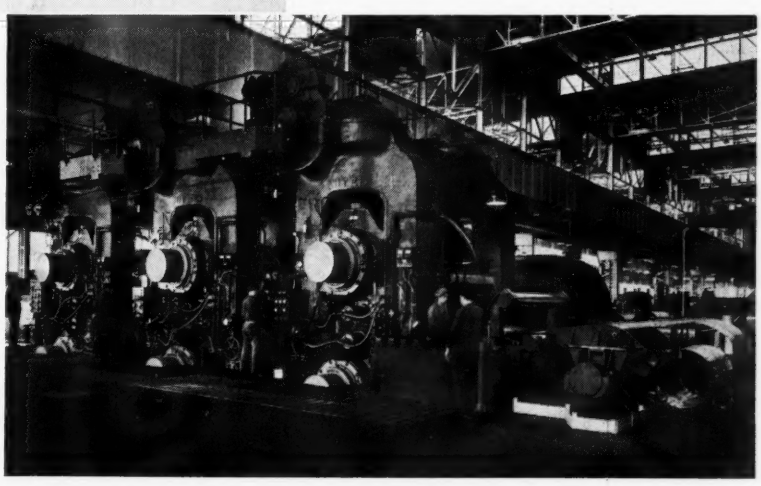
The hot-rolling house, showing slab-heating furnaces, hot stands and control pulpits



Hot-rolling motor room; right, m.g. sets and, left, finishing stand motors

The hot-section motor room houses five of the seven motor-generator sets and all the hot-section main drive motors. All the equipment is controlled from a common control desk.

The bus-bars of the 11,000 and 2,300-V enclosed metal-clad switchgear are of aluminium channel construction. Generally, except for the overhead feeders, l.c. cable is employed in conduit and embedded in concrete. Control houses for the auxiliary motors are situated in the various mill buildings close to the equipment served. The two control houses in the cold-section building are underground.



Three-stand cold-rolling equipment which will reduce to No. 24 gauge thickness

What is Ohm's Law?

By D. J. Pearce, M.Sc., A.M.I.E.E.

Its relevance in modern developments

AS a result of a discussion in the columns of the ELECTRICAL REVIEW about four years ago*, I was induced to read Ohm's works in German, and wish to thank *E. T. Z.* and the Technischen Hochschule, Berlin, for the opportunity to consult some I could not find in England.

In 1876, the British Association Report on Ohm's Law was presented. Ohm's Law was then verified for German silver resistances within six parts in four million. Quoting it, the statement of Ohm's Law is that, for a given conductor in a given state, the electromotive force is proportional to the current produced. The quotient of the numerical value of the electromotive forces divided by the numerical value of the current is defined as the resistance of the conductor; and Ohm's Law asserts that the resistance as thus defined does not vary with the strength of the current.

In other words, voltage/current=resistance is not as clear a statement as voltage/current=a constant, because Ohm's work is worthless if the resistance of a conductor is not a constant.

Expressing Resistance

Ohm, in 1826, was certainly the first to demonstrate and print the fact that applied voltage and current are proportional in a conductor, although Cavendish, in 1781, obtained some results on the subject. In the 1826 paper Ohm uses the modern German word for resistance, "widerstand," but in his 1827 pamphlet he uses "die reduzirte Länge"—reduced length—for the same property. This reduced length is not evaluated except by the expression actual length/conductivity×area of section.

Although this latter is correct, Becquerel, Pouillet and Davy were also working on the point, and Ohm does not appear to have been the one responsible for it. In using "reduced length" Ohm seems to be attempting to express resistance in terms of a length of known section and conductivity, which is a step away from the trend towards our present method of stating the property of resistance and its unit. In the 1826 paper experimental details are given and the Law is deduced from them, but in the 1827 pamphlet no reference is made to the experimental details. Instead, an assumption is made that the current density and potential gradient in the wire are proportional. However, previous to Ohm's analysis, muddled use of "quantity" and "intensity" of a current was the rule, and we have to thank him for introducing the modern conception of voltage and current in their place. Ohm is therefore only clear and original in showing the proportionality between voltage and current in a conductor, but is neither when attempting to discuss resistance.

The secrets of Ohm's success lie in the use of a bismuth-copper thermocouple, which eliminated the polarisation, &c., of a voltaic cell, and in the use of a galvanometer having a linear scale. The thermo-junctions were placed one in melting ice and the other in boiling water, and the copper conductors were brought out to mercury cups, one end of the conductor under test being put into each cup to complete the circuit. One lead to a mercury cup was a straight wire and lay in the magnetic meridian. Directly over it was hung a magnetised needle suspended from a torsion head by a flattened gold wire. The normal position of the needle was along the wire. When current flowed in the wire, the needle could be kept in this position by rotating the torsion head to an extent depending directly on the current. By investigating the relation between the length of conductor under test and the torsion head setting, a law of the form $X=a/b+x$ was found, where X= torsion head setting, a depends on the exciting voltage, b represents the unchanged part of the circuit, and x is the length of the conductor under test.

In one case the thermocouple was run at room temperature and 0 deg. C. From these results, Ohm's Law was deduced, assuming the voltage of the thermocouple to increase directly as the temperature difference.

Ohm's education at Erlangen University was interrupted, apparently due to lack of money, but he returned to take his degree in 1811. After teaching mathematics and physics in several institutions with great success he was forced to retire into obscurity because of the bad reception of his pamphlet, especially by the Berlin Academy. He continued his teaching in 1833. His work was recognised by the English scientific bodies and he received the Copley Medal in 1841. He died in 1854, aged eighty-five, while director of studies at Munich, apparently without continuing his work on the electric circuit. Even as late as 1851, Prof. Riess, of Berlin, published a text-book using the older ideas in place of Ohm's Law. Joule published his law about the heating due to an electric current in 1846; it leads to the same conclusion as Ohm's Law. Ohm's Law of acoustics, by the way, is due to the same man.

Extent of Application

Let us now turn to the question at issue and consider how widely Ohm's Law applies. The British Standard Glossary states that a conductor is "a body or substance which offers a low resistance to the passage of an electric current." A conductor, on the basis of the electron theory, is a body whose atoms possess free electrons, *i.e.*, electrons able to transfer themselves from one atom to the next. The electric current is then explained by the transfer of electrons throughout a circuit caused by an e.m.f. being introduced into it. A very different state of affairs must exist in a metal rectifier, because the current depends on the polarity of the applied voltage for one thing. The explanation of what occurs at the active layer is certainly far more complicated than that of current flow in a conductor, and the consideration of a few moderately complex cases will show how the Law may be treated.

First, in the instance of conduction in a liquid, the liquid ionises more or less freely into positively and negatively charged ions, and the movement of these and their charges to cathode and anode, respectively, allows the current to flow in the circuit.

In the case of water, the ions are equivalent to hydrogen atoms each minus an electron and oxygen atoms each plus two electrons. On arriving at the cathode and anode these become hydrogen and oxygen gas, so that a change occurs at the electrodes. A potential difference of 1.48 V is necessary before current will flow, and energy is supplied to accomplish this change. Any extra voltage is absorbed in ohmic drop which two extra electrodes inserted in the water will show. A strict proportionality between current at the main electrodes and voltage across the extra electrodes exists, because no chemical change occurs in the water itself.

Again, in the case of thermionic emission, energy is absorbed when the electrons are emitted from the cathode and the space charge introduces a further complication.

Thus, the ohmic drop proportional to current may be just one factor in a large number. But where the flow of electricity is accomplished by an interchange of electrons between atoms, as in metals, Ohm's Law applies.

* May 18th, 1934, *et seq.*

Commercial Electric Cooking in Switzerland

PARTICULAR interest has been shown in Switzerland in recent years in the development of large electrical kitchen installations such as those in hotels and sanatoria. To meet gas competition it is necessary for electricity to be supplied without the usual regard for the time of day during which it is used.

It has been found, however, that while generally peak loads correspond to the hours of the day when a kitchen installation will show its peak consumption, this peak in a large kitchen is relatively unimportant and does not have any serious effect on the load curve of the network. Studies of the comparative consumption of various kinds of fuel per person and per day have been made to permit the companies to provide rates which will compete with gas and coal installations. It is considered essential that supply undertakings should have cooks who are trained in the use of electrical cooking equipment who can visit new customers and explain the proper preparation of dishes with the new apparatus. This is thought to be even more important than training the housewife to know how to use her electric cooking installation. One line of propaganda which has been found effective is to point out that plate warmers and similar apparatus need no longer be kept in the kitchen near the source of heat, but can be installed where they are really needed. Another is that electric cooking requires less fat or butter, experiments having shown a possible saving of 25 per cent. of fat over gas cooking. An interesting idea which has been tried with considerable success is to suggest to prospective customers that they should visit some existing installation. It has been found that those hotels and other large establishments which have electric kitchens are generally pleased to show them and to explain their advantages. This not only allows a prospective consumer to get a clearer idea of what could be done with his kitchen, but the explanations given by a distinterested third party carry more weight than those of the supply undertaking's representative.

High-Pressure Boilers.

By V. Walker, A.M.I.E.E.

A review of recent advances

CONSIDERABLE progress has been made in the fabrication of boiler drums since the adoption of fusion welding for this class of work. Riveted drums are not suitable for high-pressure conditions, due to the danger of defects and deformation occurring during manufacture, which can set up local internal stresses endangering the drum when under load. These stresses can be relieved by annealing, but this would affect the tightness of the riveted drum. Drums that are built up and welded can be stress-relieved by heat treatment.

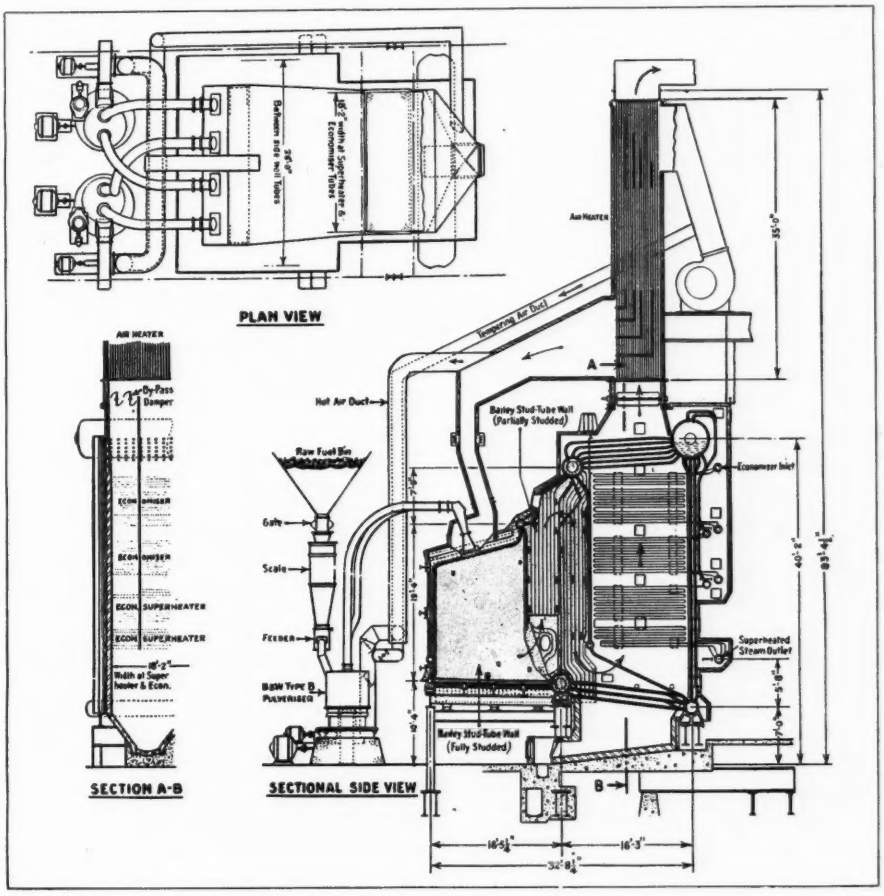
Fusion welding of boiler drums for high pressures has not as yet been generally adopted in Europe, forged or riveted drums being mainly used. Drum sizes, boiler design, and commercial considerations usually dictate the method of fabrication. Fusion welding has, however, been included in the boiler codes of various countries, and in several plants in Germany atomic hydrogen is employed for welding high-pressure drums. In the United States practically all the large boilers are now provided with welded drums.

The thickest boiler drum plates welded are now about 5 in., due to the limitation in equipment for X-ray examination of the joint. The plate thickness which can be accurately formed by cold blending also limits the thickness. As a 5-in. thickness in American designs permits the use of 1,400 lb. per sq. in., it is likely to be a contributory factor in establishing high pressures in this region.

A bent-tube boiler has been designed with a modified tube size and spacing so as to afford more favourable ligament conditions, and

Boiler plant of unusual design to be installed in an American power station

permit a drum thickness which can be fusion welded. The cost of forged drums is much greater than that of the welded drum; this tends to handicap the bent-tube type of boiler for high pressures. A thicker plate section where the tubes enter is employed in another design to provide the required ligament strength. The edges are bevelled down and welded to a thinner section where ligament considerations do not establish the plate thickness.



Boilers of the bent-tube and straight-tube sectional-header types are being employed for high pressures, the choice depending upon available space and cost. With few exceptions English and American practice has been to retain well-tried features of design rather than to employ unconventional types. With the adoption of such pressures as 1,400 lb. per sq. in., and temperatures as high as 950 deg. F., steam conditions have had an influence in reducing the size of the boiler tube bank before the superheater.

Recent boiler designs are almost completely counterflow in the application of the superheater, economiser, and air heater, which permits high efficiency in the use of the heating surface, as well as in the overall performance. This is especially important in the case of the superheater, where the outlet gas will approach the temperature of the steam if parallel flow is employed. Some designs result in a small water storage capacity in the boiler, which is not, however, considered objectionable by some operators, especially with pulverised fuel.

The elevation of the boiler drums to obtain sufficient head for satisfactory thermo-syphon circulation in the boiler tubes allows for a space being available for the superheater and economiser in the same casing, the economiser section being what might be considered a forced-circulation boiler.

The furnace water walls must absorb a large proportion of the heat, in order that the suspended ash particles may be cooled below the fusion point before entering the boiler and thus avoid slag accumulation on the front tubes.

In one design of cross-drum boiler there is a low bank of tubes between the furnace and the upper section which contains the superheater and economiser, the latter extending the full width of the boiler and being placed in the upper part. A vertical water-cooled baffle divides the space above the lower bank of tubes into two unequal sections, the rear section containing additional economiser surface, while the superheater is installed in the front section. The furnace gases after passing over the lower bank of boiler tubes are thereby divided into two parallel paths. The superheater is located close to the furnace in order to obtain the maximum heat absorption rate for the high steam temperature. The boiler tubes interposed between the furnace and superheater and economiser form an effective slag screen.

Constant superheat and protection against overheating during starting periods are obtained by control of the gas flow by means of dampers at the boiler outlet. When bringing the boiler into service the damper controlling the front section is closed and the rear one opened, so that no gases pass over the superheater surface. When on load, the front damper is opened and the rear one closed, so that all the gases pass over the superheater until the unit is operating at the desired temperature and approximately half load, after which the rear damper is adjusted so that sufficient gas is by-passed around the superheater to maintain the desired steam temperature.

Another somewhat unusual design is to be installed in an American station where a h.p. turbine is superimposed on the l.p. turbines. The boiler is designed for 1,450 lb. per sq. in. and 925 deg. F. with a capacity of 350,000 lb. per hr. The design required the boiler to be installed in an existing boiler house having columns 28 ft. 10 in. between centres, forming a relatively low compact unit. Coal having a fusion temperature of 2,400 to 2,700 deg. F. will be burnt in a slag-tap furnace.

Instead of a slag screen and relatively cold secondary furnace, the boiler is arranged with open passes interposed in series between the furnace and superheater, no boiler convection bank being ahead of the superheater. The walls of the open

passes are vertical and of partial stud tube construction, thereby presenting a high heat absorption surface for rapidly cooling the gases and slag. The superheater and economiser are adjacent to the open passes, and are not exposed to the radiant heat of the furnace, and no cooling tubes are therefore required between this section and the combustion chamber.

Provision is made for the control of steam temperature by the installation of a vertical baffle extending from front to rear of the boiler, which partitions off some 20 per cent. of the convection pass adjacent to the side wall. This by-pass contains a lower economiser, the water circuit of which is in series with the upper counter-flow and the intermediate parallel-flow economiser sections. The lower economiser is of a parallel flow, with water entering at the bottom. At full load the by-pass dampers are open so that the maximum amount of gas will pass over the lower economiser, and on low load they may be closed.

For minimising tube fouling, one installation employs a special arrangement of boiler tubes in which the tubes are at an angle of 45 deg. from the horizontal, and are expanded into straight headers which provide straight vertical lanes between the tubes. This also induces more positive water circulation.

Plant Under Construction

Several units are being constructed in the United States for a capacity of 500,000 lb. per hr. at 1,400 lb. per sq. in. and 900 deg. F. These units will supply h.p steam to turbines superimposed on existing machines. The largest h.p. unit is guaranteed to produce a million lb. of steam per hour, which is delivered to a 40,000-kW turbine exhausting at 200 lb. per sq. in. to existing turbines. It is designed for a pressure of 1,325 lb. per sq. in. and 925 deg., and is of the twin-set six-drum bent-tube type with continuous loop superheater and two fin-tube economisers and vertical shaft Ljungström air heaters. The furnace is completely water cooled.

The next unit to be installed at the Battersea power station is designed for a working pressure of 1,420 lb. per sq. in. and 965 deg. F. The maximum capacity will be 550,000 lb. per hour. This unit will have a very large combustion chamber of 30,000 cu. ft., the superheater being arranged in two sections with a desuperheater between the two for temperature control.

The Le Mont boiler being installed at Deptford West will have a capacity of 280,000 lb. per hr. and work at 375 lb. per sq in. and 790 deg. F. This boiler, which has come rapidly to the front during the last two years, has a forced-circulaton system. The feed-water is passed through the economiser in the usual manner. From the boiler drum the water is circulated by a pump, and distributed through headers to the water wall and main bank of boiler tubes back to the drum. The water is distributed by means of short nozzles from the headers to the tubes, the correct amount of water being supplied to each generating tube according to its heat absorbing capacity.

A large Löffler boiler to work at 1,900 lb. per sq. in. has been installed at Brimsdown "A" power station. These boilers, which are outstanding features in British power station practice, will be watched with considerable interest.

Tests indicate that the temperatures of the metal in superheaters during starting up of the boiler are not excessive when due care is taken in the operation of the drain valves. Excessive maintenance of superheater elements is often due to faulty steam distribution. Experience with soot blowers shows that they are sometimes limited in their effectiveness in slag removal. It is becoming general practice to fit the withdrawal type of blower in the combustion chamber.

Welding of steam and feed-water piping is becoming more common, and appreciation of the highly specialised technique is becoming more known. The use of steam temperatures above 850 deg. F. necessitates a piping material superior to ordinary carbon steel, and carbon-molydenum alloy has been chosen in some instances. This metal may be readily welded, but requires prompt stress relieving upon completion of the weld. Large units at high pressures require the use of fairly large steam piping of heavy cross section, and due to mill limitations the length of section decreases as the weight or size increases. This necessitates making many joints or welds in large h.p. piping. Consideration has been given to large piping made by fusion welding, similar to the process of welding boiler drums, and opinion is favourable.

Various types of joints are in use on the heads of h.p. heaters, the use of which may be extended to pipe joints where welding is inadvisable. Field welded joints are stress relieved by the aid of portable single-phase transformers, the heating transformer being applied to the welded joint and brought up to 1,150 deg. F., and held at that temperature for about an hour for each inch of wall thickness, then slowly cooled back to room temperature. In some cases preheating to a temperature of 600 deg. F. is employed. Covered electrodes are used with a d.c. arc; when welding carbon-molybdenum steel the coating of the carbon-steel welding rod contains molybdenum. Induction-type heating equipment is also used for large joints.

Domestic Refrigeration.

An all-the-year round business

By W. H. Rayner

ALTHOUGH, to some extent, traders in foodstuffs, both wholesale and retail, have realised the benefits of refrigeration, it seems that the householder is slow to do likewise. Several reasons may be suggested for the reluctance of the general public to install refrigerators in their homes, but there is one outstanding cause—lack of understanding of what refrigeration can do. Most people look upon the purchase of a refrigerator as a luxury and as an expense to be considered, if at all, after all other home requirements are satisfied.

Mr. W. H. Rayner

The season has now arrived when some effort is made by manufacturers and distributors to dispel this ignorance and misunderstanding, but after a brief campaign, refrigerator advertising will be suspended until next spring. This intermittent activity accounts largely for the unresponsive attitude of the public, who are, in effect, told that, in the opinion of the producers, refrigeration is necessary only during hot weather. People buy goods for the service these goods will give them, and unless and until they know that a refrigerator will be useful to them during all seasons, they will hesitate to invest in such an expensive appliance, no matter how attractive the purchase terms may be. It is, therefore, of the utmost importance for the refrigerator industry to consider whether the appeal of refrigeration cannot be broadened to cover the whole year.

The practical basis of such an appeal lies in the perfection of the refrigerator as a means of hygienically storing food. Hitherto, attention has concentrated upon high temperature as the chief danger to food, and for most householders high temperatures mean anything over 70 deg. F. Rarely is it realised that food deteriorates rapidly if kept in an atmosphere of over 50 deg. F., and that for about five-sixths of the year the temperature of the outside air is over that figure. Still more rarely is it realised that humidity accelerates decay, even when the temperature is fairly low. Dust is another enemy which is guarded against by the food merchant, but generally either ignored or treated negligently by the food user.

A sound case can, therefore, be made out for the refrigerator as the only place where food can be kept *during any season* free from contamination and decay. The ordinary larder has free ventilation, which means that it is constantly supplied with damp air and dust, but even when favourably situated for coolness, its temperature is liable to be over the critical level for the greater part of the year. Frequently its proximity to the kitchen keeps its temperature higher than that of the outer air. In contrast, the refrigerator provides ideal conditions of temperature, dryness and purity independently of the state of things outside.

A supplementary argument—again independent of the season—can be built up on the refrigerator as a means of increasing the attractiveness and variety of daily diet. Cold dishes are at their best served at a temperature of 40 deg. F., and the same applies to a variety of beverages. There are also many cold sweets which cannot be made successfully at any season without a refrigerator.

Convenience in catering is another strong point. A refrigerator enables meals to be prepared beforehand and kept in perfect condition for serving at any time. Domestic labour difficulties accentuate this advantage and make the refrigerator almost a necessity to the housewife who wishes to find time to entertain guests.

Although not related to those points already discussed, an important factor in restricting refrigerator sales is the inadequate size of the kitchens in many modern houses. Steps should be taken to induce builders to make provision for installing refrigerators either in the larder space or elsewhere. A three-pin plug for a refrigerator should be an essential item in the standard wiring specification for practically any size of house.

The I.E.E. Revisits Birmingham

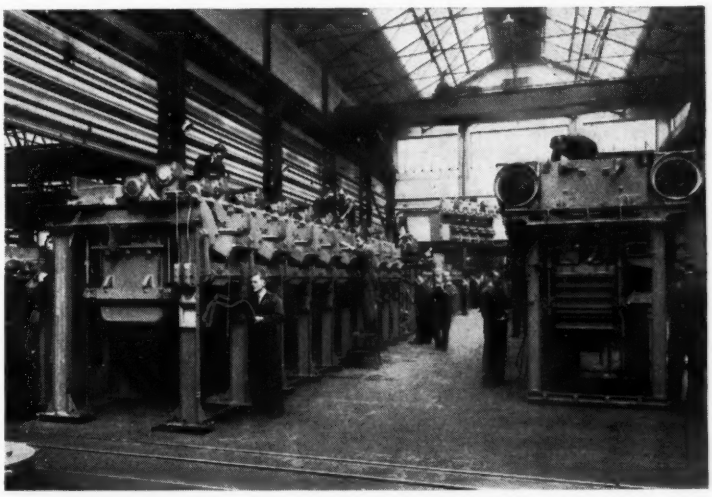
Summer meeting tour in the South Midland Centre area

AFTER an interval of thirteen years members of the Institution of Electrical Engineers and their ladies returned last week to Birmingham and district for their summer meeting, under the presidency of Sir George Lee, and at the invitation of the South Midland Centre.

Badges issued to participants numbered 345, of which about one-third were in respect of part of the tour only, and the official proceedings commenced on the Monday evening with an informal re-union at the Grand Hotel (headquarters) with music and light refreshments. The personal contribution of Mr. George Willetts (chairman of the local centre of the Junior Institution of Engineers) enlivened the evening's entertainment.

Early the next morning, Tuesday, motor coaches conveyed the party to Hams Hall, where the ladies joined Mrs. Forrest for coffee, while Mr. S. T. Allen acted as guide to the nearby 132 kV grid sub-station of the C.E.B. to see how the 1,200 insulator units are regularly washed with water while alive (ELECTRICAL REVIEW, April 1st, 1938, p. 468).

Double circuit towers carry six 50,000-kW overhead grid lines from this primary transforming and switching point, which is connected by four sets of three-phase 11-kV feeders, each consisting of four single-core cables per phase, making 12 cables per feeder, or 48 separate cables in all, laid underground to the generating station, which is reputed to be the largest power station fired with pulverised coal in Europe. It also incorporates one of the largest electrostatic boiler flue-dust precipitators so far installed for this particular purpose. This plant was described in the ELECTRICAL REVIEW of April 3rd, 1936, p. 488.

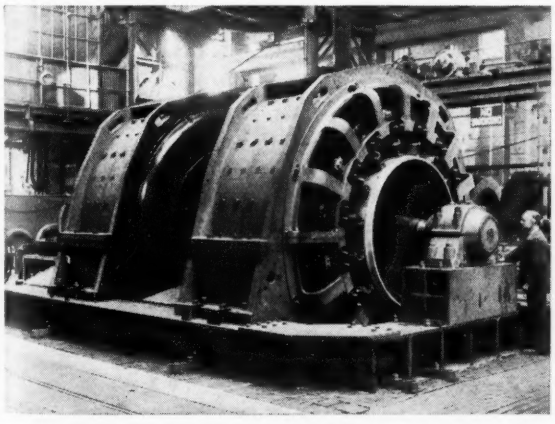


A section of the G.E.C. high-voltage switchgear works

The Hams Hall "A" plant is now practically complete with 250,000 kW installed. The new "B" station will ultimately be of 321,000 kW, with six main turbo-alternators of 50,000 kW at 1,500 r.p.m. They will generate at 33 kV with steam at 650 lb. and 825 deg. F. All station motors of 90 h.p. and over will operate at 3.3 kV. The twelve boilers will be of 320,000 lb. each, fired with pulverised coal on the unit system.

Witton Activities

Leaving Hams Hall at noon on the Tuesday the party was conveyed by motor coaches to Witton for luncheon at the Magnet Club as the guests of the General Electric Co., Ltd.



Two 2,750-h.p. G.E.C. winding motors for South Africa under test

This company has just commenced its 50th year of trading, and to mark its own and the city's jubilees has endowed a fund of £10,000 at the University of Birmingham for the establishment of two scholarships. Dr. A. H. Railing presided and proposed the principal toasts, which were replied to by the Lord Mayor (Councillor E. R. Canning) and Sir George Lee. During the afternoon most of the ladies attended a lecture-demonstration on modern lighting by Mr. R. O. Ackerley.

The rest of the party commenced a tour of the works in the dry battery section and ended at the switchgear testing plant with its two million kVA alternator (ELECTRICAL REVIEW, March 13th, 1936, page 378), and the high voltage laboratory for studying the behaviour of insulating materials with the aid of mechanical testing machines whereby tensile, torsional and vibration loads can be applied to insulators while subjected to electrical stresses up to 750 kV at 50 cycles, 800 kV impulsive and a million volts at frequencies up to 125,000 cycles.

Among typical products seen in course of construction were large 3,000-r.p.m. turbo-alternators for Woolwich, Darlington, Stepney, Stockport and Johannesburg; 5,000-kW d.c. generating plant for Imperial Paper Mills, Ltd., and winding equipment for South African gold mines, including 2,750-h.p. motors and motor-generators. Metalclad control gear was being assembled for iron and steel works in Turkey, 6.6 and 11-kV "Subgear" units for use at home and abroad, 6.6-kV truck cubicles for the New Consolidated Gold Fields, 33-kV metalclad gear for Southampton, 33-kV outdoor oil circuit-breakers at 500,000 kVA for Cape Town, and 132-kV outdoor oil switches of 1,500,000 kVA for the C.E.B. One transformer of 45,000 kVA at 132/33 kV for Birkenhead and two of 30,000 kVA at 132/66/11 kV for Chester are being made to the order of the C.E.B., while among steel mercury arc rectifiers are examples of both the water-cooled and pumpless air-cooled types arranged for grid control.

Tuesday's events concluded with a civic reception in the evening at the Council House, Birmingham, with dancing and musical entertainment, refreshments being served in the art galleries and museum.

The Rugby Tour

On the Wednesday morning the party drove in motor coaches to the Rugby works of the British Thomson-Houston Co., Ltd., several additions to which include a large section devoted to fabrication by welding which itself has an all-welded steel framework and was erected in record time. The spacious new single storey shops in which mercury vapour lamps are made represents a complete departure in layout from most other lamp works.

In the 1,000 ft. long turbine shop, apart from several smaller sets for export, there are at present the fourth 75,000-kW machine for the Barking power station of the County of London Co. to operate at 600 lb. and 850 deg. F., also the second 30,000-kW extraction type machine for the Dagenham works of the Ford Motor Co., for steam at 1,200 lb. and 725 deg. F., which will eventually be raised to 900 deg. F.; other sets are a 60,000-kW machine for the Kent Electric Power Co., and one of 50,000 kW for the Ironbridge station of the West Midlands J.E.A. A 10,000-kW, 3,600-r.p.m. superimposed machine for the Delray power station of the Detroit Edison Co., U.S.A., will operate at 815 lb. and 900 deg. F., and exhaust into the existing steam mains at 410 lb.

A feature of the turbine shop is the pit in which electrical rotors are subjected to balancing and overspeed tests. It is enclosed by three covers, each weighing 40 tons, and an arrangement of lighting, adjustable mirrors, and telescopes enables any part of the rotor to be inspected in the safety of an adjoining room. The largest rotor tested so far has been the Barking 94,000-kVA unit weighing 70 tons and running at 1,725 r.p.m., or 15 per cent. overspeed.

Two 2,938 h.p. Ward-Leonard-Ilgner winder sets for East Rand Proprietary Mines, Ltd., new central shaft, South Africa, will be among the largest yet installed, and will have cylindro-conical drums 12 ft. to 36 ft. in diameter. They will be used for winding loads of 20,000 lb. from a depth of 6,000 ft. at a speed of 50 ft. per second. Other winder equipments were also seen under construction.

Large transformers are being made for Ironbridge, Bristol, Bradford, Torquay, and for export to Johannesburg. A feature of this department is the 12-stage impulse generator designed for an output of one million volts, and its energy when fully charged is 12 kilowatt-seconds. It is protected against power follow-current from the transformer by means of an air-blast expulsion gap. An impulse test is initiated from the control gallery by closing a push-button, which applies voltage from a peaking transformer to the grid of a thyratron. Through discharge circuits, this operates the beam control devices in the high speed cathode-ray oscillograph, and also a small impulse generator, occupying a space of less than one cubic foot, but having an output at 50 kV, which induces the main impulse generator to discharge.

One shop has been specially laid out exclusively for fulfilling an order valued at over £1,000,000 for the supply and erection of control and auxiliary equipment for 799 motor coaches and the wiring of 251 trailer coaches for the London Passenger Transport Board (see last issue p. 64).

To the research department has been added an air-conditioned section equipped for the production of 16 mm. cinema films of technical and instructional character, complete with recording studio, pre-view theatre, animation camera equipment, cutting and printing and processing sections.

Special arrangements having meanwhile been made to show the ladies the domestic appliance and lamp factories, the several parties eventually met for luncheon in a marquee, the guests including the Mayor of Rugby. The address delivered by Mr. W. C. Lusk, chairman of the company, who presided, was acknowledged by Sir George Lee.

At the B.T.H. works, Rugby. Above: Assembling control gear for the London Passenger Transport Board. Left: A view of the new welding shop

Leaving Rugby on the Wednesday afternoon the party drove through Stoneleigh Abbey Park to Warwick, where Sir George Lee coupled with his reply to the charming speech of welcome by the Mayor (Councillor F. W. Turner) appreciative thanks for the hospitable entertainment of the Midland Counties Electric Supply Co., Ltd.

After an official photograph of the assembly had been taken the afternoon soon passed in exploration of the Castle and its beautiful grounds. Tea and light dinner were served in a large marquee in the public park, Mr. A. D. Phillips presiding, while Mr. H. Hooper (retiring chairman of the Centre) deputised for the President, who had temporarily returned to Birmingham for business reasons. A short drive brought the party to Stratford-on-Avon in time for the evening performance of "Two Gentlemen of Verona" at the Shakespeare Memorial Theatre, the return to Birmingham being made at about midnight.

Car Making

On the Thursday morning the party set off for the Longbridge works of the Austin Motor Co., Ltd., which is a remarkable organisation with 6,000 production machines. One car is the week's work of nine men as compared with 55 men in 1922.

The works has its own turbo-generator station, for the press shop alone needs 1,300 h.p. and contains nearly 60 presses ranging up to 800 tons. The largest die weighs 20 tons and the largest blank has a surface area of 27 sq. ft. The value of the plant in this shop alone is £250,000 and when in full production 600 tons of sheet steel is consumed per week. Electric discharge lighting is employed in this shop, while in the finishing sections there is an unusual arrangement of closely spaced enclosed reflector fittings set at an angle to provide an intensity of 15 ft.-c., which is increased to 24 ft.-c. where inspection takes place.

In the body shop the component parts are welded together by a combination of electric and gas processes. Many electric polishers are utilised. The foundry is completely mechanised; 20,000 cores are produced daily and 200 tons of iron and steel is poured weekly, the castings ranging in weight from 215 lb. to 5 oz. Among the most striking features are the sizes of the various shops and the extensive conveying systems employed.

At Stourport

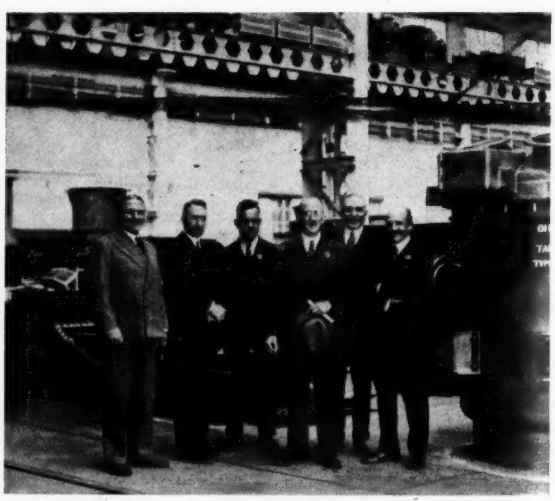
Luncheon on the Thursday was served in a marquee at the Stourport power station of the Shropshire, Worcestershire and Staffordshire Electric Power Co. Lord Eltisley (director) presided and Sir George Lee and Mr. E. Morgan (managing director) also spoke. There was a short river trip for those who preferred not to inspect the generating station, which was in course of erection on the occasion of the Institution's previous similar tour.

To-day it houses 146,000 kW, is being extended, has interesting types of switchgear and its layout is unusually spacious.

After tea at Stourport the party drove back to Birmingham, where the General Electric Co., Ltd., entertained 500 guests in the evening at the Grand Hotel, including dancing, two cabaret performances with some special coloured lighting effects and buffet refreshments.

The I.E.E. Gala Night

On the Friday morning a visit of inspection was made to the trunk, toll and "Central" exchanges in Telephone House, Birmingham (ELECTRICAL REVIEW, January 29th, 1937), followed by luncheon at the Grand Hotel as



The I.E.E. visit to the B.T.H. Rugby works: Left to right, Messrs. A. P. Young (works manager), G. M. Campbell (B.T.H. director), H. Hooper (chairman, S. Midland Centre), Sir George Lee (President), Mr. H. N. Sporborg (B.T.H.) director and Dr. A. H. Railing (G.E.C. director)

the guests of the G.P.O., Mr. T. Brannd, Postmaster-surveyor, presiding. The speech by Mr. H. Faulkner (P.O. superintending engineer) was replied to by Sir George Lee, who combined with it thanks to the Postmaster-General for hospitality on a scale exceptional for a Government Department.

Sir George next proceeded to carry on a mutually congratulatory conversation by telephone with Mr. C. Griffiths, P.O. engineer and president-elect of the South African Institution of Electrical Engineers, who spoke from a seaside holiday resort 100 miles from Durban. The circuit utilised consisted of many hundreds of miles of land lines, the radio link and, finally, the co-axial cable from London to Birmingham.

Part of the proceeds of sweepstakes organised during a "mystery drive" on the Friday afternoon, stopping for tea at Chadwick Manor, went to the I.E.E. Benevolent Fund. Indoor and outside lighting effects provided a charming setting for the gala night at the Botanical Gardens, Edgbaston, on Friday. Alderman Sir Percival Bower and Miss K. Bower received the guests on behalf of the Corporation Electricity Supply Committee and Mr. H. Hooper occupied the chair at dinner.

Sir Percival's speech was responded to by Sir George Lee for the I.E.E. and Mr. Hooper's was acknowledged by Mr. F. Forrest for the Birmingham Electric Supply Department. Well-deserved tributes having been paid to the local organisers of the meeting, the part played by Mr. R. H. Rawll (hon. local secretary) was specially marked by the presentation to him of a set of golf clubs, while Mrs. Rawll received a handsome set of hair brushes, subscribed for by the party.

Dancing was kept up to a late hour and so ended what must surely have been, notwithstanding somewhat uncertain weather, the most happy and sociable gathering of the series so far held.

Fruit and Bulb Storage

An application of electricity which is becoming of increasing importance

DURING the past few years the use of refrigerated storage for fruit and bulbs has come greatly into prominence—in fact, so far as apples are concerned it jumped in three years from 200,000 cu. ft. in 1932 to 2¼ million cu. ft. in 1935. While electrical or refrigerator salesmen may be able to cope adequately with a straightforward cold room installation, many other problems are introduced where fruit—and particularly apple—storage is concerned, so that some knowledge of the special difficulties is essential.

Tests have shown conclusively that different kinds of apples require different temperatures, and while all absorb oxygen and give off carbon dioxide, they do so at different rates. Some apples may be kept in ordinary air at from 34 to 40 deg. F., others need a 10 per cent. concentration of carbon-dioxide, while still others need an independent control of oxygen in addition. Carbon-dioxide "scrubbers" are often necessary to eliminate any excess of CO_2, but owing to the different temperatures and gas contents which various kinds of apples require it is undesirable to keep different varieties together.

Modern stores should be gas-proofed and well insulated with cork in timber linings. It is also desirable to have an air space between the outer walls and the walls of the building in which the store is built. The inside of the store is covered with galvanised sheeting, all joints being sealed.

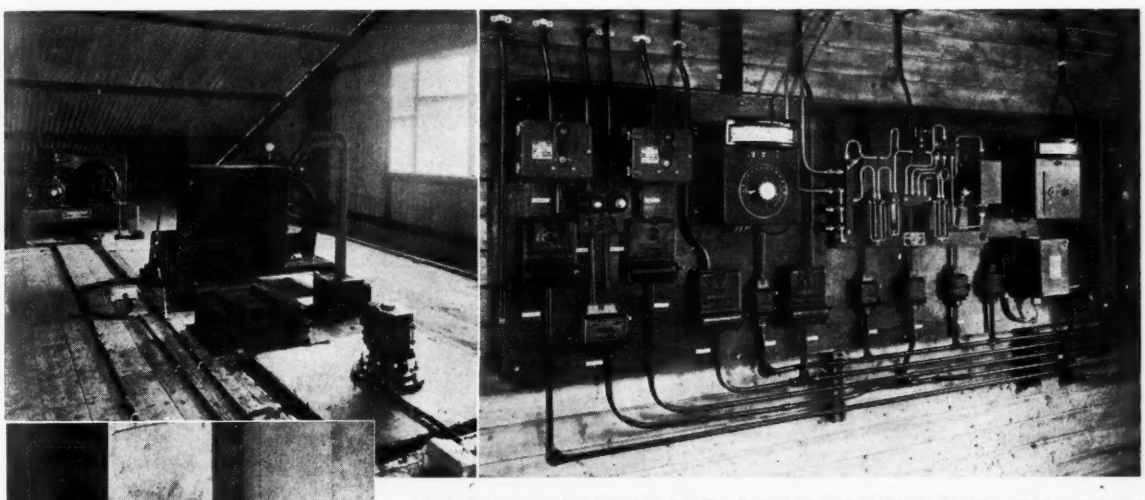
The cooler in a "gas" store usually takes the form of a central vertical coil with the fan on top and the motor outside the chamber. The air is drawn along the ceiling and blown down through the central coil, passing radially outward from the bottom of this to all parts of the chamber, beneath a suitably designed false floor in the form of timber grids. It is necessary to provide external reading thermometers. The type usually provided is the electrical distance pattern, which allows of the actual thermometers being placed in the boxes of fruit, the temperature being read outside the room as required. One of these instruments can be provided to handle as many as twelve chambers, each of which has two thermometers.

Equipment for indicating CO_2 only includes an indicator on the main control board coupled up to an air pump and a differential gas meter, registering the percentage direct on the scale of the instrument. Gas is drawn from the chamber through a copper tube to the air pump and meter. In chambers where only CO_2 control is required, it is usual to ventilate the chamber as required by means of a ventilating plug in one of the doors. Oxygen control involves two additions to the equipment. The first is the indicating apparatus, similar but more elaborate than the CO_2 apparatus. The same sampling tube is used, but a more expensive meter, together with absorber and furnace and a dual pattern indicator are needed.

The second addition is the "scrubber." Low concentration of oxygen can only be obtained by allowing the fruit to consume the excess in the store. Consumption of oxygen means production of CO_2 which, if blown out of the room, would be replaced by fresh air containing more oxygen, which is not desired. Therefore the CO_2 has to be absorbed by a "scrubber" instead of being blown out. Two or three chambers can be operated from one condensing unit. In the installation illustrated above, which is Mr. Sketch's farm at Great Totham, Wickham, Essex, the compressor and condenser unit are situated in the loft—an installation carried out by the International Refrigerator Co., Ltd.

Refrigerated bulb stores have enabled higher prices to be obtained for early flowers. After flowering the bulbs are dried and packed in a store held at a temperature of about 48 deg. F. until the early autumn, when they are planted in trays and left in the open for a month or so. After another short period at a low temperature in storage, during which they are well watered, the leaf emerges from the soil and the trays are taken out and subjected to light irradiation.

This process produces an artificial climatic cycle, resulting in early flowering of the bulbs and also a higher fertility percentage. In addition, the cold stores, of which many have been installed by Frigidaire, Ltd., can be used for holding the flowers themselves for up to a fortnight, to tide over a sudden glut or to await an expected increase in demand.



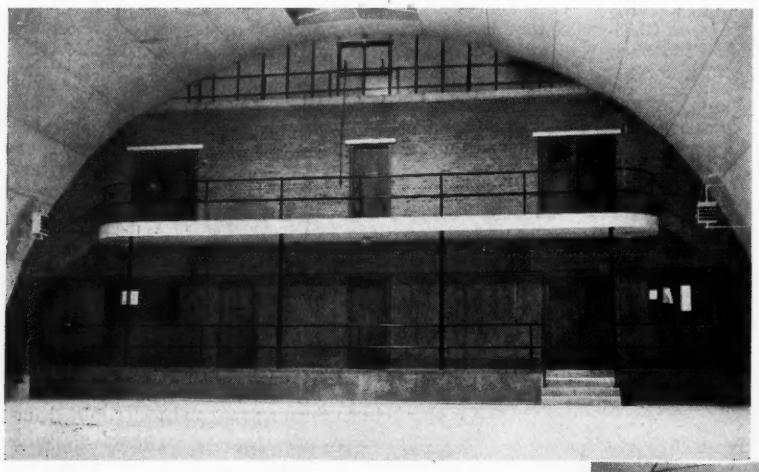
A fruit storage installation by the International Refrigerator Co., Ltd., at Great Totham, Essex. In front of the condensing unit is the fan which pumps air down the ventilating and cooling shaft (left). On the right are the electrical gas and temperature recorders

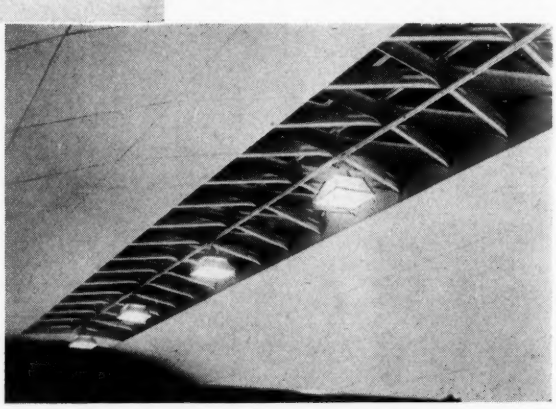
Drill Hall Lighting

An Essex installation

LAST month H.M. Secretary of State for War officially inaugurated the newly built headquarters of the 193rd Anti-Aircraft Battery of the 59th (The Essex Regiment) A.A. Brigade, R.A. (T.A.) at Leigh-on-Sea, Essex.

Mr. G. Shenstone, F.R.I.B.A., F.S.I., is the architect responsible for the construction of the new building, which is of interest structurally, there being only one other like it in this country. It has been planned to accommodate one battery of an anti-aircraft brigade. The brick-built front portion is of two stories, consisting of recreation room, sergeants' mess and men's changing room, on the first floor, with officers' mess, lecture room, office accommodation and cloakrooms on the ground floor. Along one side are the boiler house for water heating and a rifle range. At the rear there are a workshop and stores, gun and lorry sheds and a two-storey house for the resident sergeant-instructor.





Above: Showing the uniform nature of the lighting. Below: Method of mounting the "Blaizolite" units

The centre of the site is occupied by the lofty drill hall, which is 80 ft. long by 60 ft. wide internally. The arched roof is covered with asbestos carried on a "Lamella" pressed steel unit structure and lined with an insulating wall board, as the accompanying illustration indicates. The relatively small amount of glazing admits daylight surprisingly well. This type of construction was adopted in order to provide an unobstructed height of 30 ft. at the centre, which is necessary because the new 3.7 in. gun is to be used inside the hall for training purposes. This also required special attention to be paid to the means of artificial illumination.

The wiring contract and general lighting scheme were carried out by Electrical Installations, Ltd., on conventional lines. It was at first proposed that twelve lighting points should be provided, but fewer than half this number has sufficed and a saving of electricity of the order of 60 per cent. has resulted.

Five Type-B.15 "Blaizolite" projector lanterns (supplied by Baxter & Caunter, Ltd.) have been suspended centrally, as shown in the accompanying illustration which was reproduced from an untouched photograph taken at night by the unaided light of these lanterns on panchromatic film with medium exposure. The mild steel housing is painted inside and out and has a hinged door with a hammered cathedral glass front, which is rectangular. The cast-iron top and shackle incorporate an insulator and four eye bolts for suspension. A single 500-W lamp fits into a goliath holder and surrounding it are four lenses, fitted at right angles to each other, with a fifth below the bulb. They are adjustable both vertically and horizontally to allow for the slight variation in the position of the filament in different makes of lamp. These lenses collect the light and direct it on to four glass mirrors, so attached to the inner surfaces of the lantern as to be adjustable for projecting the light uniformly over an extended or a restricted area as may be desired without casting objectionable shadows or causing harmful glare.

In this manner the total of 2,500 W has furnished an intensity of illumination along the centre line of the hall of 12.2 ft.-candles, diminishing at 12-ft. spacing to 8.2, 4.2 and finally to 2 ft.-candles on the side wall 30 ft. from the centre. At extreme ends of the hall the equivalent values are 5.5, 5, 3, and 1.5 ft.-candles. These intensities are considered to be remarkably uniform and consistent in view of the fact that the five 500-W lanterns are mounted 30 ft. above the working plane.

Designing a Physics Laboratory

PROBLEMS involved in the planning of a large physics laboratory for ultimate research, having regard to the need to allow for possible developments during the next twenty or thirty years, are discussed by Professor F. A. Lindemann in *Oxford*. An important consideration is that as physics is concerned with measurement of very small quantities, outside disturbances must be avoided; this entails the building of the laboratory as far from a road as possible. A large well-equipped workshop and glass-blowing department are essential and in order to prevent transmission of vibration from the machinery, the latter must be housed in a separate mechanically insulated brick (not reinforced-concrete) building.

Varying requirements of each physicist for light and darkness make a large number of small rooms a great advantage. These should be separated by comparatively light partitions which can be removed without great expense if more space is needed for any experiments. Researches into the properties of the nuclei of atoms entail the production of an electric field due to millions of volts, which is traversed by the charged particles at very high velocities. A large room must, therefore, be included, twice as long as it is broad and high, with strengthened floors and electrically shielded to eliminate interference with radio receivers in the neighbourhood. Investigations into the stability of nuclei involve the use of instruments sensitive enough to detect the disintegration of a single atom and the research rooms in which this work is carried out have to be enclosed in earthed copper foil.

Air-conditioning plant and a decontaminating room in which the workers put on special shoes and overalls are also required to prevent the ingress of dust and moisture. This room largely determines the architectural layout of the whole scheme. If the cyclotron method, which is confined to, at most, two types of particle, is ultimately adopted, less space would be required and the high-voltage room could be divided into a series of research rooms. Several feet of lead or yards of water must be interposed between the high-voltage laboratory where X-rays and neutrons are produced by bombarding atoms and the rest of the department, but the main safeguard is distance, so the high-voltage room juts out as far as possible from the laboratory.

Another line of attack on the nucleus derives from accurate spectroscopic measurements (within one-billionth of an inch). Masses of concrete lying upon cork resting on sand are required in order to damp out vibration in the appropriate rooms, the temperature of which must be thermostatically controlled within 0.1 deg. C. over prolonged periods.

Very low temperatures are achieved in a series of stages; liquid air is used to produce liquid hydrogen, which is used to produce liquid helium. Liquid air has to be stored so that it can be delivered in lorries once a week at reasonable cost. Hydrogen is most cheaply procured by decomposing water electrolytically during the night and compressing the hydrogen in the morning in a high-tensile-strength steel cylinder buried in the ground. Compressors for this purpose and for liquefying the hydrogen cause vibration and are therefore housed in a workshop building. A strong electro-magnet, with a three-ton lift to enable it to be used on the various floors, is required in order to reach temperatures below 1 deg. abs.

Making Vehicle Batteries

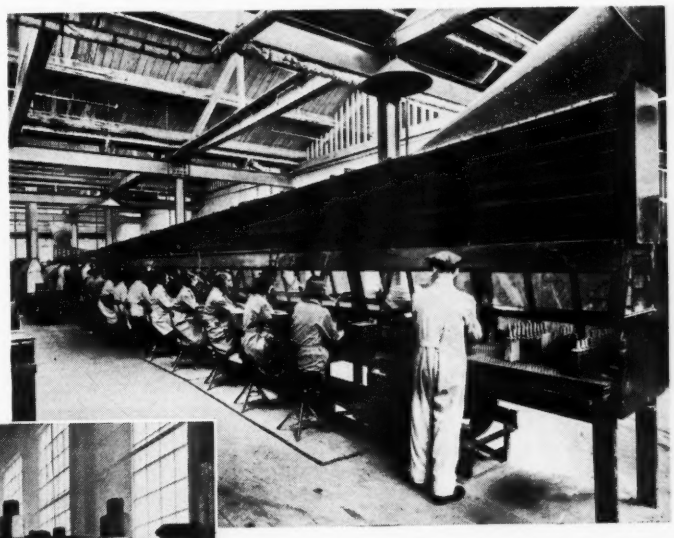
Mass production in a Birmingham factory

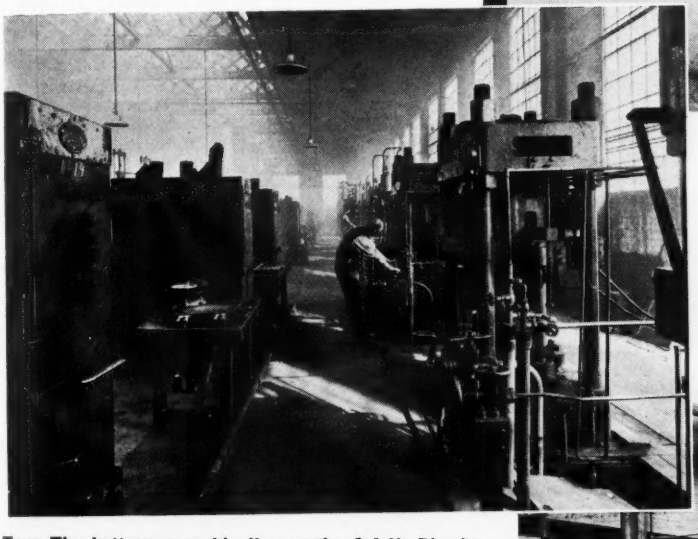
Many processes once thought essentially "hand jobs" are now carried out with even greater accuracy and reliability by means of mass-production methods at this up-to-date battery works

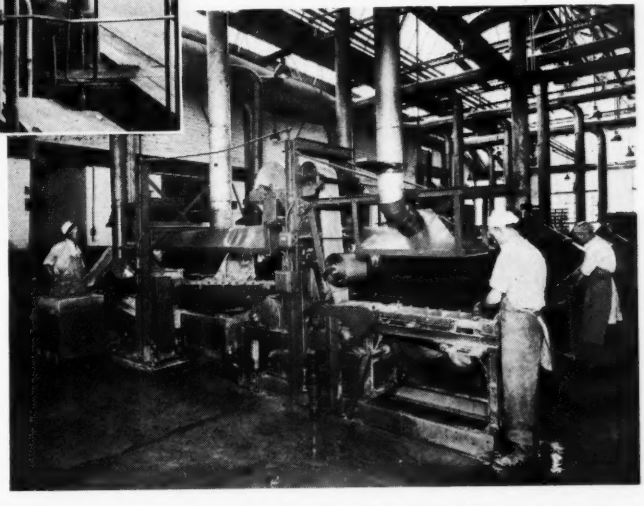
THE idea that mass and high-quality production are incompatible except where strictly "engineering" processes are involved is shown to be a fallacy at the C.A.V. battery works at Birmingham. Here commercial-vehicle batteries are manufactured on a large scale under a scheme of mechanisation comparable on the score of speed and precision with that found in modern automobile production. This achievement is emphasised by the fact that one process in particular, pasting the plates, may still be regarded as essentially out of the machine-handling field on account of the great skill necessary in hand pasting.

Production may be considered broadly as comprising three stages—the manufacture of the case and the plates and the major assembly. The continuous-flow principle has been adopted throughout the factory. Each process is arranged as a self-contained specialised undertaking, but is linked with those immediately before and after it so that the whole can be viewed as one major process. Motor-driven conveyors are an essential part of the "flow," in many cases automatically carrying the component or product on to the next operative.

"Milam," the acid-proof moulded material of the case, is produced from a mixture of bitumen and asbestos. Under controlled temperature the bitumen is brought to a "tacky" state in oil-jacketed machines rather like dough mixers, and asbestos fibres are gradually added. The oil for these and other machines is fed from a central heater and circulated at 370 deg. F. through a thermal siphon. Carefully weighed portions of the "dough" from the mixers are fed to hydraulically-operated and steam-heated presses and are moulded by the engagement between the fixed die at the top and the moving mould at the bottom. The case has a finish like polished ebony when it leaves the press.







Top: The battery assembly line at the C.A.V. Birmingham factory. Centre: The case-moulding shop, showing the hydraulic presses. Right: Automatic pasting and pressing machines

Special acid-resisting, non-conducting inserts for reinforcing the inter-cell partitions are applied to the die before the press is operated and thereby incorporated in the actual moulding. Before it is passed on to the assembly line each case is subjected to a severe electrical test, electrodes with a p.d. of 40,000 to 60,000 V being applied to the opposite sides of the cell partitions and again to the inside and outside of the case. A complete surface flash-over indicates freedom from material defects.

Ten per cent. antimonial-lead from which the plate grids are cast is first melted in dome-shaped kilns and then transferred to temperature-retaining pots from which the casting machines are fed, *via* transporter containers. The molten metal is pumped from the kiln to the transporter and also from the transporter to the pot. The transporter is rail-borne and electrically propelled by an incorporated drive, the electricity distribution being arranged by overhead trolley-wire and sliding pick-up. From a lip on the retaining pot the metal is pump fed to the automatically operated moulds of the casting machine as they are carried past the lip by the rotating table on which they are mounted. The moulds open and close at the required points under ramp influence. A band conveyor carries the castings from the moulds to presses which remove surplus metal and trim them up ready for pasting.

In the pasting shop the lead oxides and other materials for the paste are prepared in rolling-mill mixers and the paste is fed to the hoppers of the pasting machines. The grids pass under the hopper on a conveyor, each receiving the requisite quantity of the paste which is pressed into casting by a roller under which it travels. Scrapers take off the excess paste and the plates are automatically turned over before being passed under another roller to ensure that both sides have the same treatment.

The plates are now subjected to a long and exacting conditioning treatment in a carefully designed sequence of stages to ensure that there shall be no cracking of the paste. First, in boxes, very slow oxidisation is allowed to take place. With the paste still moist, the plates are arranged in alternate positive and negative formation in bottomless crates in which they are passed on a very slow moving conveyor through a tunnel 190 ft. long where they are gradually and uniformly dried and hardened.

The conveyor travels against an air stream, the temperature of which is constantly controlled. Thus the air through which the plates pass during their journey through the tunnel

becomes progressively drier until at the end the plates are bone dry. The centre part of the tunnel is heated and the temperature of the air as it passes through the tunnel is increased to 140 deg. F. and then reduced to 65 deg. F. at the air-exit end. The critical stage process represented by this gradual heating and cooling of the plates will be appreciated from the fact that on the resultant porosity of the paste, which depends on the drying, rests the electrical capacity.

The positive and negative plates of each group are next connected by burning on lead bars, and the result is large two-volt cells without capacity and ready for the formation room. The problem in this room is the maintenance of a constant temperature of acid at all times in spite of having to handle in it large tonnages of plates. Accordingly there is at one end of the room an air-conditioned chamber in which each batch of plates is left for a couple of days to take up the temperature of the air. When, therefore, the plates are ultimately immersed in the acid there is no appreciable "unbalancing" of temperature.

An elaborate system of conveyors carries the crates of plates to the acid tanks. Two of the bottomless crates are nested in each tank and sit on insulators at the bottom. Lead-bar connections to a central bus-bar system result in a particularly neat arrangement of forming circuits and eighty boxes are formed at a time on 110 V. The formation period is a little more than three days. After this the plates are lifted and steamed and then sent through a drying tunnel to the stores ready for the assembly line after they have been built up in jigs in positive and negative cell formation.

All the battery components flow into the assembly department to meet at the required points on a conveyor, along the side of which a row of skilled workers handle the partial or complete assemblies at the various stages, each operative dealing with one specific operation. Separators are inserted between the plates, the groups of plates are put in the cases, the case lids are fitted and the batteries are sealed, connecting lugs for the groups of plates are fitted, the posts and inserts are made solid in jigs, and the batteries are tested for intercell "shorts"—all on the band. Another belt carries the batteries to the charging department where they are filled with acid, put on circuit and fitted with vents. Finally another conveyor takes the product to dispatch.

The production of the C.A.V. armoured plate battery is basically the same as that described. The grid of the positive plate is, however, cut up into strips, a perforated ebonite shield is vulcanised on each strip and the strips are built up again as a grid. This construction prevents cross buckling. The company's prismatic acid-level indicator, thin "knock-out" seals for export batteries and non-corrosive terminals are a few of the special features which also interested us.

In a well appointed tool room on and off tolerances to a "half-thou." are effected by chromium plating. A jig-boring machine is housed in its own room under constant-temperature conditions.

To detect any possible sources of mechanical failure the test rooms subject the batteries to very definite ill-treatment. In one case batteries are carried in pivoted cradles under which revolves a turntable with a number of ramps up which the cradles climb to be allowed to fall again, giving each battery about 100 "bumps" per minute. In another case a motor-cycle wheel is suspended in a carriage to which the batteries for test are attached. The wheel rides on a pulley at a speed equivalent to 18 m.p.h. and by means of a cam and shaft arrangement pot-hole effects are produced on the carriage.

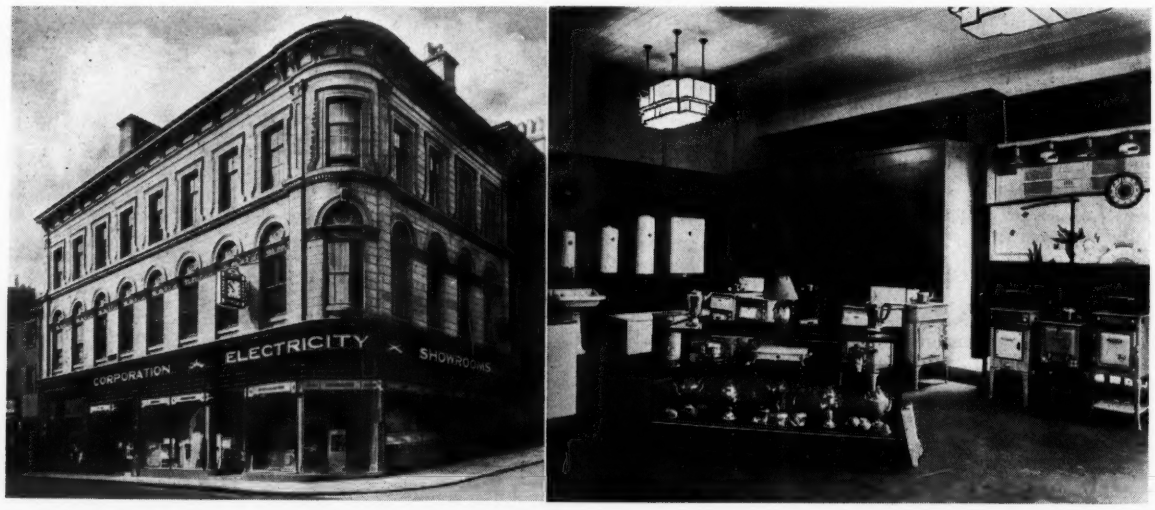
New Halifax Showrooms

THE new offices and showrooms of the Halifax Corporation Electricity Department were formally opened on July 6th by Sir Harold Mackintosh, Bt., at 19-23, Northgate and Crossley Street. The new premises have been converted from what were originally four separate premises into one self-contained showrooms, demonstration centre and administrative offices. On the ground floor the whole of the Northgate premises have been adapted for showrooms, with the inquiry bureau immediately inside the door of 19, Northgate. Here consumers may inspect and have explained to them the latest developments in electrical appliances for household and business use. The lighting of the showrooms has been carried out in the most modern methods, alternative systems being introduced to show the various types available, including lighting by fluorescent tubes for colour effect. The windows are illuminated by a combination of mercury lamps and tungsten filament lamps, which gives a close approach to daylight. Also included in the windows are special floodlight fittings in colours to enable the window lighting to be adapted to any desired colour scheme. The fittings throughout the showrooms and windows have been supplied by the General Electric Co., Ltd. Adjoining the showrooms is the demonstration room and lecture theatre which will accommodate 100 people. In this room demonstrations of electric cooking will be given weekly and lectures and demonstrations, including film displays, will be given from time to time. The demonstration room has been fitted with the latest labour-saving devices, including an electric cooker, refrigerator, dish-washing machine, &c. From the inquiry bureau a staircase leads to the first floor, where are accommodated the offices of the engineer and manager, the whole of the technical staff and drawing office. The second floor accommodates the whole of the clerical staff. The offices have been fitted with electrical thermostatically controlled heating of various types, including skirting heaters, tubular heaters and convectors, and an air-conditioning unit. The whole of the alterations were carried out under the direction of the Corporation's own staff.

In opening the showrooms, Sir Harold Mackintosh complimented the Department on the extent and attractiveness of the new premises at the corner of Northgate and Crossley Street, as compared with the former showrooms, and expressed a hope that the demand for electricity and appliances would be such that it would not be very long before the need arose for still larger premises.

The brief ceremony at the showrooms was followed by a luncheon. Alderman J. H. Waddington, chairman of the Light, Heat and Power Committee, was supported by the Mayor (Ald. F. Watkinson) and prominent local people. Sir Enoch Hill proposed a toast to the Mayor and Corporation of Halifax, in the course of which he paid tribute to the town's electrical engineer and manager, Mr. G. A. Vowles. The Mayor responded. Sir Harold Mackintosh proposed "The Electricity Undertaking," and gave statistics showing the remarkable advance of the undertaking.

Alderman Waddington, responding as chairman, said that last year they had over 2,000 new consumers, or six a day. The domestic consumption at Halifax was one-third of the output, representing an average of 1,000 kWh per household.



The new Halifax showrooms: (Left) the exterior of the premises and (right) the water-heating and cooker display

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Reorganisation of Distribution

I have read the recent correspondence with regard to the above and consider that it is very unfair of Mr. Sayers to suggest that no constructive proposals have been put forward. The I.M.E.A. and the Committee of Smaller Undertakings have both made representations to the Minister of Transport containing quite definite constructive proposals.

We can all agree that the supply industry as at present constituted has made wonderful progress through very difficult times, and that a certain amount of reorganisation is desirable and would be beneficial. In the long-drawn-out discussions on what is admittedly a very difficult problem it is a most striking fact that every individual claims that his undertaking is highly efficient. In the main I think the large majority of municipalities could justify that claim, but where is the authority to investigate and test these claims and to point out the defects, if any?

Unfortunately, there are a growing number of municipalities who are afraid of their electricity undertakings making too rapid progress at the expense of their gas undertakings, and one is obliged to admit that where a lot of ratepayers' money is invested in a gas undertaking which is in danger of becoming a losing concern, the position is very difficult. This by no means applies to the smaller undertakings alone and under the White Paper proposals such an undertaking would be either very much enlarged or taken away from the local authority altogether. I suggest that the first alternative is very undesirable, and the second alternative would be disastrous as the whole of the interest and influence of the local authority would then be behind the gas undertaking. What hope would electricity then have for public lighting and many other services?

The authors of the White Paper appear to have seized upon the defects of the present system without remembering its many virtues; the proposals in question do not centralise administration as suggested because most of our public services are already centralised in the local Town Hall and if we now set up a separate body for administering electricity, from a public service point of view it is decentralisation. The one idea behind the White Paper Proposals is that if an undertaking is big enough it must be good and this is by no means true in practice from the consumers' point of view.

Very small and isolated undertakings are quoted and their selling prices held up as a horrible example of inefficiency but no provision is made to see that they receive their bulk supply at reasonable prices. Why should the grid between our large undertakings be a national charge but a small and isolated community have to bear its own transmission costs? Low selling prices can only be obtained by intensive development which in turn can only be accomplished if the bulk supply prices are reasonable. I suggest that no undertaking's charges should exceed the grid tariff.

Very many perfectly good municipal undertakings will be handed over to companies and most of the uneconomic rural areas will be in the hands of private enterprises to deal with. Is it likely or fair to expect rural uneconomic development in these circumstances? The "rural development" in the promised Bill is a similar cry to the "cheap and abundant supply" of the 1926 Act and about as meaningless; it is merely paying lip service to the rural areas.

If the authorities consider uneconomic rural development is desirable from a national point of view then the actual financial loss entailed will have to be borne by the supply industry as a whole on a national basis or nothing, or next to nothing, will be done.

We already have a national levy for standardising frequency. Why not a levy for subsidising uneconomic rural development and nationalising secondary transmission charges for bulk supply? We already have regional boards for dealing with wages and conditions of employment on which both companies and municipalities are represented. Why not form similar boards clothed with the necessary authority (1) to administer the national levy; (2) to co-ordinate development; and (3) to see that proper and reasonable facilities for carrying on that development are available?

Some years ago our public health services were in a strikingly similar position to the supply industry to-day. The majority were doing their job but without any overriding authority or leadership. A minority were neglecting their work. As a result the Ministry of Health was given authority to see that a minimum of public service is maintained and no one can deny that the result has benefited all and any that are willing to do their job are not interfered with.

We all know that for the continued success of the C.E.B. a continually increased output is absolutely essential and the most solid way of achieving this end is intensive domestic development where local knowledge and personal touch is a very necessary factor. Let us therefore forget grandiose schemes of huge amalgamations the result of which is at best doubtful and cannot be foreseen, and progress on well-established lines which have already proved their worth. Many will not agree with me because no one loves an overriding authority: to those I would say, "What is your alternative?"

Fleetwood, Lancs., *July 12th.* W. P. LILWALL, *Engineer and Manager*

Impulse Recording Strips

I wish to record permanently small impulses of electricity on a strip of paper by means of colour reaction. I have tried potassium-iodide-starch paper and also ferricyanide paper and have not had much success, perhaps because I have not got the correct proportions, as the reactions do not seem very sensitive. Can any of your readers tell me how to make potassium-iodide and ferricyanide papers which are light-proof, *i.e.*, they must not go blue on exposure to light?

Also, I would like to try what is termed "polarity paper," which turns red at the positive pole. How is this made and is the colour permanent? I shall be glad to have any other colour reactions of this nature. My main trouble is in ensuring permanency. J. J. WILD.

London, W.4, *July 6th.*

Electrical Imports of Iraq

IN his report on economic and commercial conditions in Iraq (Stationery Office, 1s. net), Mr. J. P. Summerscale, late Commercial Secretary to H.M. Embassy at Bagdad, states that the previous report (1933-35) closed on a note of optimism regarding the economic development of Iraq, which has been borne out by the progress registered in the last two years. Expansion has been in general along already established lines.

The United Kingdom enjoys no commercial privileges in Iraq as against any other country. The trade relations of the United Kingdom and Iraq are, however, mutually satisfactory. The United Kingdom, both as a buyer and seller, plays a leading part in the commercial exchanges of the country and has maintained in a satisfactory manner its share of Iraqi trade. Dealing with the import trade of Iraq, Mr. Summerscale states that the value of imports of electrical machinery and equipment is one which has grown considerably in the last few years. The United Kingdom has secured a valuable but irregularly spread share in this category.

The total value of imports of electrical machinery and apparatus in 1937 was Iraqi dinars 189,972 (dinar=one pound sterling), of which the United Kingdom's share was 106,525 dinars, the other principal suppliers being the United States with 33,114 dinars and Germany with 25,683 dinars. Imports of electric dynamos and motors came mainly from the United Kingdom (15,199 dinars) and Germany (4,218 dinars), while the trade in electric batteries and accumulators was shared about equally by the United Kingdom and the United States, each with a total of over 6,000 dinars. The United Kingdom's share of the electric lamp market rose from 3,953 dinars in 1936 to 6,841 dinars in 1937. The Japanese share was under 3,000 dinars in both years.

Radio apparatus may be divided under two main heads. The technical equipment for the use of the air ports and broadcasting stations in Iraq comes chiefly from the United Kingdom and the majority of domestic receiving sets are of United States origin, the balance being supplied by Holland, Germany and the United Kingdom. The growth of the demand for receiving sets is likely to continue. A limited broadcasting system has been introduced in Iraq and a larger station is under construction. The United Kingdom is the chief supplier of insulated cables and wire and its shipments in 1937 were valued at over 19,000 dinars. Germany has a small share in this line. Imports of telephones are not very great and in 1937 the value of instruments supplied by the United Kingdom was 6,500 dinars as against 12,000 dinars in the previous year. Electric fans are an important item of import in which the United Kingdom share appears to be on the increase, its share of a total value of 29,301 dinars in 1937 being 13,728 dinars, the other chief supplier of fans being the United States (5,715 dinars).

Parliamentary News (BY OUR SPECIAL REPORTER)

The Electricity Bill

In the House of Commons on July 6th Mr. T. Williams asked the Minister of Transport if he was aware of the widespread anxiety concerning the future of electricity undertakings; and if he was now in a position to state when the proposed Bill was likely to come before the House.

Mr. Burgin said he was not in a position to add to the statement made by the Prime Minister on March 1st regarding the proposed Bill to provide for the reorganisation of the distribution of electricity.

The Testing of Meters

Mr. Hepworth asked the Minister of Transport what arrangements were being made for the testing of existing meters under the Electricity Supply (Meters) Act; and whether he could give any indication of how long it would take to carry out the necessary testing operations.

Mr. Burgin said that under the Act existing meters used by ordinary consumers must be brought in within a maximum period of ten years from the appointed day, which was July 1st, 1938, and must be tested and certified if re-issued. In the meantime a consumer could apply for the designation of a meter examiner to determine any difference as to the accuracy of his meter.

Radio-electric Services

On July 6th Mr. Day asked the Secretary of State for Air if he would state the number of airports that were at present equipped with radio-electric services; the number that were at present being considered; and when a definite decision would be arrived at.

Captain Balfour said that there were at present 22 civil aerodromes and airports equipped with radio-electric services and their provision at three others was under active consideration. In addition, following the recommendations of the Maybury Commission it was proposed to make these services available at a number of additional stations in accordance with traffic and operational requirements.

Mains in Roads

On July 8th, after the West Yorkshire Gas Distribution Bill had been read a second time, Major Milner moved that it be an instruction to the Committee to insert provisions in the Bill for the further and better protection of highway authorities than was afforded by the Gas Works Clauses Act, 1847, in respect of the laying of pipes and mains by the company in county roads and any other roads vested in any local authority, the filling in and restoration of such roads after the pipes and mains had been laid, and the duty and expense of altering the position of such pipes and mains after any subsequent diversion, alteration, or improvement of such roads.

Sir R. Clarry, in opposing the instruction, said that if an amendment were to be made it should be done by a public Bill and should apply to all undertakings—electricity, water, and so on—which used the roads. Road works were normally done under the superintendence of the local authority concerned.

The Government view was stated by Capt. A. Hudson, Parliamentary Secretary, Ministry of Transport, who said that in a Bill of this kind the question of the protection of the highway should be considered most carefully. Road construction in 1847 was a very different matter from what it was to-day, and the question of the efficacy of the Gas Works Clauses Act to meet present conditions was deserving of consideration. The Minister was prepared to leave it to the Committee to decide, after having heard the evidence, first, whether further and better protection was necessary, and, secondly, if so, what form that protection should take. The Committee would not be able to decide on the first point if the instruction were passed. It might feel that, owing to the large area supplied, this was a special case which required special protection. While this Bill might deal with a special case, the question of the breaking up of streets gave rise to difficulty, not only in the case of gas, water, and electricity.

The Minister proposed to consult with the other Government Departments concerned about the type of protection which might be suitable in future Bills of this character. The Ministry was prepared in the case of this Bill at the appropriate time to furnish to the Committee a report setting out its views for consideration. It would also be desirable to add a clause to the Bill giving the Minister of Transport the same protection as was afforded the County Council.

Mr. O. Lewis asked if "consulting the other Departments" meant with a view to promoting legislation. Capt. Hudson said it was with a view to seeing how far the Act of 1847 was still applicable. The whole case for taking up the roads should now be reviewed.

The instruction was withdrawn.

Interference with Radio

On July 11th Captain Cunningham-Reid asked the Postmaster-General approximately how many complaints his department received annually of wireless interference caused by neon sign installations; and whether any action was contemplated in this connection.

Sir W. Womersley, Assistant Postmaster-General, said that approximately 2,000 complaints were received annually regarding interference with wireless reception caused by neon sign installations. In most of these cases the owners of the installations agreed to fit interference suppression devices, although there was at present no legal power to compel them to do so. The necessary inquiries regarding the possible scope and operation of a new Wireless Telegraphy Bill to deal, *inter alia*, with the question of electrical interference with wireless reception were being actively pursued.

In the Courts

Factory Act Prosecution

At Hull on July 8th Needler Bros., Sawmills, Ltd., were fined £60 for the non-observance of the Electricity Regulations under the Factory and Workshops Act. It was stated in evidence that one of the company's employés was working at night and in the course of his work took up a portable lamp. He received a shock which caused him to fall from a platform on which he was standing; he sustained a fractured skull and died. It was alleged that the lampholder was defective and not properly earthed.

The defence was that the lamp was not the one which the company provided for the purpose. They could not recognise it as one which had been issued from their store. Another employé said that he believed that the lamp came from the other Hull works of the company; he had handled it earlier and it had appeared to be in order.

In imposing the fine the Stipendiary Magistrate said that he would recommend the payment of the amount to the dead man's relatives.

Fraudulent Consumption

A proprietor of a battery-charging shop at Droylsden, Manchester, Thomas W. Newman, was fined £5 last week for illegally obtaining and consuming electricity the property of the Corporation Electricity Department.

According to the *Manchester Guardian*, Mr. C. A. Marsh, prosecuting on behalf of the Electricity Department, said that an inspector visited Newman's shop after the supply had been cut off by the Department and found that by means of wires passed through the roofs of three intervening houses the defendant was receiving a supply from his brother-in-law's house. The rate at this house was ½d. per kWh while the rate for the shop was 3½d.

Pentode Valve Patent Appeal

In the Court of Appeal on Monday last the hearing was commenced of appeals by Electric & Musical Industries, Ltd., Marconi's Wireless Telegraph Co., Ltd., Standard Telephones & Cables, Ltd., and the Philco Radio & Television Corporation of Great Britain, Ltd., from an order of Mr. Justice Morton in the Chancery Division allowing the Mullard Radio Valve Co., Ltd., to amend the specification of its letters patent No. 287,958, dated December 24th, 1926, for a particular form of pentode valve.

The proceedings before Mr. Justice Morton were reported in the ELECTRICAL REVIEW of February 4th, February 25th and March 4th, 1938.

The British Belmont Radio, Ltd., against whom the Mullard Co. had brought an action for alleged infringement of the patent were not made parties to the present proceedings as the action had been settled subject to the present question of amendment.

The invention in question was "for improvements in or relating to circuit arrangements and discharge tubes for amplifying electric oscillations by means of thermionic devices."

The amendment was in substitution of claim 2 and read as follows:—"The innovation also comprises a discharge tube for amplifying electric oscillations comprising a screening grid between the control grid and the anode characterised in that an auxiliary electrode is placed between the screening grid and the anode, and is directly connected to the cathode so as to be maintained continuously at the cathode potential whereby the increase of the screening grid current at the expense of the anode current will be substantially avoided."

Mr. Justice Morton allowed the amendment asked for by the Mullard Co., but subject to the terms that no action was to be taken by that company against anybody in respect of the manufacture, sale or resale of any discharge tube manufactured before that date (March 1st, 1938) which would be an infringement of the claim as then amended.

Mr. Trevor Watson, K.C., who appeared for the appellant companies in support of the submission that Mr. Justice Morton's decision allowing the proposed amendment was wrong, dealt at great length with the technical objections to the amendment and the hearing was adjourned. It is anticipated that Counsel's arguments on the appeal will last several days.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Airing Equipment

A recent introduction by UNITY HEATING, LTD., Unity Works, Welwyn Garden City, is a small airer for drying cabinets, linen cupboards and wardrobes. The loading is only 150 W, so that it can also be used as a foot-warmer or for drying small articles such as handkerchiefs and silk underwear.

A larger capacity model with a rail above the apex and with a loading of 240 W is also available. In both cases a meshed guard protects the user from contact with the elements and also eliminates risk of fire.

The "Unity" airer

A Double Carbon-Arc Sunlamp

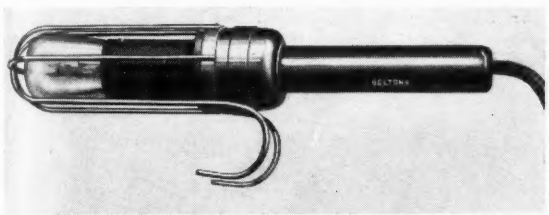
The "Compet" sunlamp is a new product of A. TAYLOR, LTD., Quay Street, Manchester, 3, for the emission of infra-red rays and ultra-violet light and designed with a view to use in the home.

Spectrum photographs taken by the N.P.L. indicate a scale of wavelengths extending from 21 (a wavelength of 0.21μ) to 70 (a wavelength of 0.70μ). The ultra-violet region of the spectrum extended from 0.40μ downward.

With the lamp operated on d.c. at 240 V, the arc length being maintained as nearly as possible at 0.25 in., the intensity of radiant energy at a point distant 10 in. from the plane of the rim of the reflector, and on the axis of the latter, was subject to variations of about 5 per cent. owing to fluctuations of the arc. The average value over a period of five minutes was found to be 0.21 W per sq. cm.

An Inspection Lamp

A recent introduction by WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester, 6, is a small shockproof inspection lamp which can be employed at either mains or battery voltage by changing the bulb.

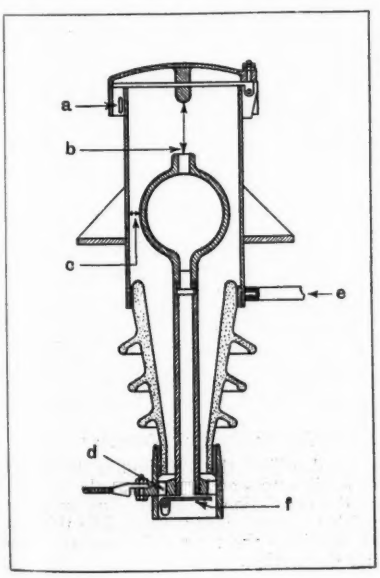


The "Goltone" inspection lamp

The handlamp is made of a moulded material and is fitted with a guard which has two hooks so that the lamp, when in use, can be suspended from any convenient bracket. A bakelite s.b.c. holder is fitted with an insulating collar.

Overhead-line Protection

For the dual purpose of protecting an overhead network from transient faults and the associated station apparatus from the effects of lightning surges, A. REYROLLE & Co., LTD., Hebburn-on-Tyne, are putting forward an arc-suppression coil, which has been developed jointly with C. A. PARSONS & Co., LTD., and a high-speed arc gap. The arc-suppression coil functions by neutralising the capacitative fault current by an equal and opposite reactive current, thus preventing power current from following the initial flash-over. It is recommended that, if owing to damage to the insulation, the fault cannot be immediately cleared by the coil, the neutral of the system should be earthed automatically so as to avoid operation of the system with one phase earthed.



The Parsons-Reyrolle arc-suppression coil (a) Ventilation. (b) Self-centring power arc gap. (c) High-speed excess voltage relief valve. (d) Ventilation. (e) Earth connection. (f) Gas relief valve.

The high-speed arc gap is designed to give instantaneous relief at a practically constant voltage irrespective of the severity of the surge, follow-on power current being prevented by the arc-suppression coil. It is preferably installed on the first tower outside the station to be protected. The use of the two devices together is advised, but either of them alone is claimed to give beneficial results.

Domestic Appliances

A range of small domestic appliances has been introduced by MAYER, NEWMAN & Co., LTD., 51, Farringdon Road, London, E.C.1.

Unusually low price is the main feature of these lines, which include two ordinary toasters available in chromium or nickel plate, as well as an automatic toaster which rings a bell at a predetermined time. A 9-in. square boiling ring with open elements and a five-heat thermostatically controlled iron are also available. The latter is chromium plated, weighs 6 lb., and has a walnut handle.

An electric hair-curling set has a hexagon-shaped handle fitted with a push-button to control the heat. It is also equipped with a Marcel waver and a set of aluminium drying combs.

An Electric Vulcaniser

A vulcaniser which has been specially designed to take full advantage of the short cures made possible by the improvement in accelerators and to give a long life with minimum maintenance costs is the "Shaw-Summit" press of FRANCIS SHAW & Co., LTD., Corbett Street, Manchester, 11.

The "Shaw-Summit" electric vulcaniser

It is driven by a high-torque motor developed specially for the duty it has to perform, the power being transmitted through a totally enclosed reduction gearbox by a phosphor-bronze nut on a specially selected nickel-steel screw. The end thrust in both directions is taken by "Timken" tapered roller bearings. Lubrication is arranged on the "Tecalemit" system. The motor and gearbox are situated above the press itself and consequently cannot possibly be harmed by steam, water and dirt.

As can be seen from the illustration, the bottom platen forms the base, thus giving the same working height on all sizes, facilitating the use of conveyor systems. The top mould, which can be adjusted to eliminate spew through inequalities in the mould joints, is attached to the upper platen, which opens up sufficiently above the operator's head to enable him to inspect and clean the mould.

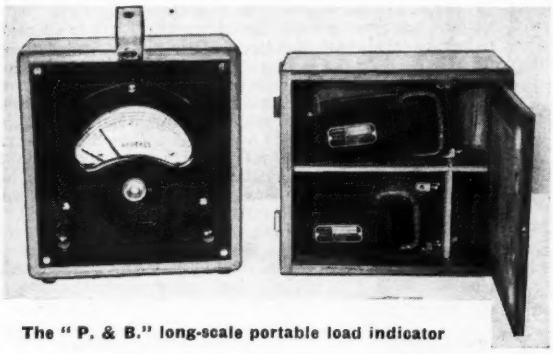
A Long-scale Portable Load Indicator

The P. & B. ENGINEERING CO., LTD., Tamworth Lane Works, Mitcham, has recently designed a portable long-scale load indicator for ascertaining the maximum load on distribution systems and sub-station plant.

The indicator is of the thermal type with a fixed time lag of 10, 15, 20 or 30 min., and is operated by "Easifix" current transformers with ratios from 75/5 to 1,500/5 A. These transformers can be clipped round a cable or fuse handle in a few seconds. The double scale on the indicator gives a total range such that the minimum reading is 1/12th of the maximum. The complete set is self-contained in a carrying case of oiled teak measuring 9 in. long by 7½ in. wide by 8 in. high when closed. It is in two parts, hinged together with sliding hinges so that the part housing the transformers is instantly detachable as soon as it is opened. When closed the

two parts are firmly held together by a snap fastening to form one case. One end of the carrying handle is readily detachable while the opposite end is fastened to the indicator case.

A metal eyelet is inserted in a strap a few inches from the

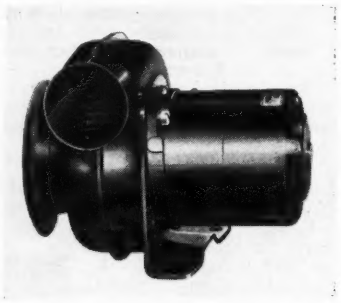


The "P. & B." long-scale portable load indicator

case for suspending the indicator, and rubber feet are fitted to the case so that the indicator may be used either hung up or standing as most convenient.

Electric Blowers

Two new blowers are being made by Delco Remy & Hyatt, Ltd., for AIR CONDITIONING AND ENGINEERING, LTD., 123d, Victoria Street, London, S.W.1. The single unit, which will operate for 25 hours on 1 kWh delivers 50 cu. ft. of free air per minute, while the twin unit, which will run for 17 hours on 1 kWh delivers 100 cu. ft. per min.



A new "Delco" blower

The stator of the motor is arranged to take two pole windings and shaded-pole starting winding. The bearings are lubricated by means of large wick-type pads around the bearings and in contact with the shaft. The motor housings are die-cast and arranged to meet in the centre of the motor to provide a complete enclosure and flanged to take the supporting bracket and fan casing. The fan runner is of the multi-vane type made of pressed steel. All motors are wound for voltages between 200 and 250 single phase, 50 cycles.

Carpet Shampooing Equipment

Last week we witnessed a demonstration of a British-made carpet shampooing machine which is being sold by R. G. DIXON & CO., LTD., 116, Victoria Street, London, S.W.1.

The "Dixon" carpet shampooing machine in action

This consists of an electric motor driving a brush revolving in a horizontal plane, the latter being fed with liquid shampoo from a container. In actual cleaning a definite process sequence is followed. First of all the carpet is vacuum cleaned to remove all surface dirt. The shampooing machine is then brought into use. The motor is started by a switch in the handle, causing the brush to revolve. Pulling the right-hand trigger releases a catch which takes the weight of the wheels at the back, so that pressure falls evenly on the brush independently of the position of the handle. The left-hand trigger is then pulled to release a quantity of the shampoo ("Merco"). This is actually fed to a soft brush situated within the main brush to create a lather.

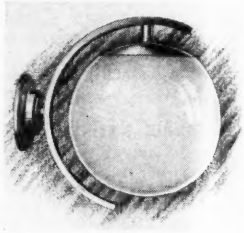
The foam has a spirit base, and though mixed with water, does not damp the carpet sufficiently to wet the back of the carpet, so that the pile dries out within four or five hours, leaving the dirt which has been brought out as a loose surface dust. The carpet is finally vacuum cleaned again to remove the dust.

The motors are rated at 400 or 600 W, according to the size of the machine, running at 1,400 r.p.m. and driving the brushes through machine-cut spiral bevel gears. The brushes can be rapidly detached from the frame to enable the machine to be used for floor scrubbing and polishing. The larger machine will, it is claimed clean 1,000 sq. ft. in an hour.

Lighting Fittings

The latest range of "Sphere" lighting fittings of SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38/39, Upper Thames Street, London, E.C.4, includes several new designs.

All models have been redesigned and improvements effected, including a new method of securely locking the glassware in position to prevent accidental displacement. These fittings are available in two forms for chain suspension, employing either a fine oval link chain or a heavier tubular chain. The wall bracket (illustrated) is of unusually attractive design and a ceiling model is also available.



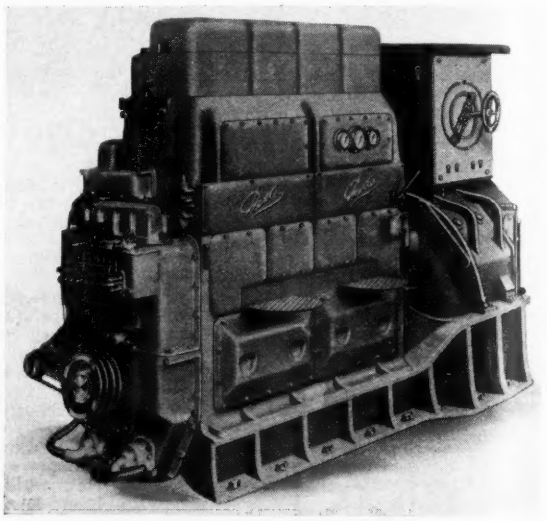
A Siemens "Sphere" fitting

Two-stroke Diesels

A development of the "blower-scavenge" engine with an improved power-weight ratio has been brought out by PETTERS, LTD., Yeovil. In the new "super-scavenge" type the scavenging is unidirectional with a blower pressure of only 1½ lb. (reduced from 2¼ lb.) per sq. in., while the arrangement of piston-controlled air-inlet ports has increased turbulence.

Forced lubrication is employed with a dry sump and part of the oil is reconditioned continuously by a Streamline filter. About 14 per cent. of the heat dissipated goes to the cooling water from the jacket system and 6 per cent. from the engine and piston cooling oil through the cooler.

The consumption of lubricating oil is given as 0.003 pint per b.h.p. hour. A full-load fuel consumption of less than 0.39 lb. per b.h.p. hr. is guaranteed, the brake m.e.p. being 67.1 lb. per sq. in. and the exhaust temperature 750 deg. F. On a four-hour full-load test, however, 0.381 lb. per b.h.p. has been achieved. At 10 and 20 per cent. overload the figures became 0.383 and 0.386 lb. On a short run at 34 per cent. overload the exhaust was only slightly hazy.



The 350-h.p. Petters "Super-scavenge" oil engine

The new engine is in production for driving industrial a.c. and d.c. generators in parallel in two to six cylinder units of 62.5 h.p. each; it runs at 500 r.p.m. and has a piston speed of 1,082 ft. per min. The cyclic variation is 1 in 150 and the power-weight ratio is about 45 lb. per b.h.p. For Diesel-electric traction service oil-cooled aluminium pistons are fitted. The weight of the four-cylinder unit of this type, which develops a peak of 350 b.h.p. at 675 r.p.m. with a brake m.e.p. of 70 lb. per sq. in., has been reduced to 28 lb. per h.p.

Expansion Valves for Refrigerators

In our last issue we described the Teddington thermostatic expansion valve for refrigerators and illustrated the note with a block which bore the inscription "The Teddington thermostat." The British Thermostat Co. says that while this is not actually incorrect it considers the term "thermostatic expansion valve" a better description.

New Books

Electric Power Transmission and Distribution. By L. F. WOODRUFF. Second edition. (Pp. 257; figs. 146.) London: Chapman & Hall, Ltd. Price 17s. 6d.

The first edition of Professor Woodruff's book, published in 1925, is well known to students on both sides of the Atlantic. Now, after an interval of thirteen years, the second edition has been published. Its scope is very similar to that of the first, although it is surprising to find that it actually contains fewer pages.

The book deals with inductance and reactance, skin effect, capacitance, steady state currents and voltages on transmission lines, circle diagrams, travelling waves, power limits and stability, mechanical principles, corona and insulators, and calculation of fault currents. An innovation is that the M.K.S. system of units is used throughout. The chapters on power limits and stability, and the calculation of fault currents are new. The latter chapter gives a brief but practical treatment of the method of symmetrical components. Three new and useful charts have also been added for the evaluation of the complex hyperbolic functions required in long line calculations. In the chapter on travelling waves the photographs of three-dimensional models illustrating wave propagation are new, and should be helpful in visualising such phenomena.

The first edition contained a brief but useful chapter on inductive interference, and it seems unfortunate, in view of the importance of the subject, that this has been omitted from the second edition. The sections dealing with insulators and conductor vibration might well have been amplified with advantage.

The book deals primarily with fundamental principles which change relatively slowly. I feel, however, that justice has not been done to the developments of the last thirteen years, and that, in 1938, the second edition does not fulfil such a useful function as did the first edition in 1925. Nevertheless, the general format of the book is very pleasing, and power engineers and students will certainly benefit from its perusal —in particular, the chapters dealing with long line calculations and circle diagrams are invaluable.—J. S. F.

Household Electric Refrigeration. By J. F. WOSTREL and J. G. PRAETZ. (Pp. 406; figs. 157.) London: McGraw-Hill Publishing Co. Price 24s.

The authors, who are American professors, explain in the preface that their book is non-technical and intended for those who wish to gain a practical knowledge of domestic refrigerators. In their attempt to simplify the subject they have produced at its best an eclectic exposition of nine leading makes of American refrigerators, and at its worst a treatise that would leave the serious student or engineer feeling dissatisfied with its insufficiency.

The book is a description of various makes rather than an attempt to explain fundamental principles. For example, in discussing types of compressors, there is no mention of the thermodynamics involved in design and operation. The reciprocating compressor is dealt with in five comparatively short paragraphs. Only one principle of absorption refrigerator is described, which leaves the wish that the authors had investigated many of the interesting absorption refrigerators being manufactured in Europe, particularly in Germany. Again, evaporators are dismissed in seven paragraphs, there being no simple explanation in the book of the calculation of heat transfer.

An important point in evaporator design is the selection of material to be used, but that subject has not been mentioned, neither has the design and construction of cabinets. The chapters dealing with the installation and servicing of refrigerators might well have been taken from a manufacturer's instruction manual, without the detail and completeness which characterises such publications. It is also difficult to understand the sequence of chapters.

A person who wishes only to gain a superficial knowledge of household refrigeration would find that this book meets his purpose, but it could not be considered as an essential addition to the refrigerator engineer's library. Like most American technical publications, it is well and profusely illustrated. It appears curious that the authors have used up nearly fifty pages to catalogue the specifications of various manufacturers when such data can be so readily obtained from catalogues or a buyer's guide.—H. C. T.

Lighting the Home. By A. B. READ. (Pp. 71; figs. 53.) London: Country Life, Ltd. Price 10s. 6d.

This is essentially a book of simple language and commonsense. The author has taken a subject which has given rise to much controversy in the past, and in a logical manner presented, room by room, his ideas of what constitutes good lighting practice.

In the treatment of the important rooms, the reader is left to exercise his own taste and choose from four alternative solutions to the problem. The simple line drawings which accompany the text are exceptionally clear and within the grasp of everyone. Little fault can be found with the general recommendations, which are based, of course, on the broad experience of the writer. One might wish perhaps to see a little more reference made to the "study lamp" as an effective portable fitting in living rooms, especially as this lamp enjoys the privilege of being the only domestic or commercial lighting fitting whose performance is standardised by the British Standards Institution, while four million table and floor lamps of this type have been sold to improve the lighting in American homes.

The present time might also have been opportune for the author to give a little more space to garden lighting; he says some delightful things about it, but one wishes he had been a little more explicit about how to do the job.

The text and diagrams are well supported by the admirably chosen half-tone plates with which the book concludes. In this section the reader can study many variations on the original themes.

Light measurement and the science of seeing receive just about the right treatment that their importance deserves, but I feel that the author might well have defined the foot-candle and not merely referred to it as "a technical term . . . . the definition of which need not bother us." On the whole, a very useful book, which should do much to promote right ideas, especially among architects, decorators, and others concerned with what are sometimes termed "the better class homes."—H. L.

Foundations of Wireless. By A. L. M. SOWERBY. (Pp. 266; figs. 158.) London: Iliffe & Sons, Ltd. Price 4s. 6d.

This is the second edition of a book published two years ago and opportunity has been taken to bring the information up to date by the addition of a few pages of text. It is an elementary textbook on the principles of radio reception, concisely written and well produced. The use of mathematics is reduced to the minimum, as the reader is assumed not to have any knowledge of electricity and to have forgotten most of the mathematics that he learnt at school; in fact, the object of the author is to state the fundamentals of the subject as simply as possible.

The first quarter of the book sketches the principles of electricity with special reference to radio reception, and from this are outlined the principles underlying the design and working of modern broadcast receiving circuits. The book should prove useful for the student who wishes, with little mathematical background, to understand the fundamental principles of radio reception.—C. G. C.

Das Aufbauprinzip der Technik. By DR. P. WESSEL. (Pp. 39; figs. 14.) Munich: Reinhardt. Price Rm.4.90.

The title of this booklet provides little guidance as to its purpose. It contains three major sections: Analysis, Idea and Reality, and Synthesis, which describe the processes of engineering creation from the mental conception to final production. All engineers who have had to deal with manufacture of machinery of any kind must have gone through the whole of the processes which are here described, but few have done so other than subconsciously. Dr. Wessel's book is definitely of a philosophical type. It is unlikely to be of interest to the majority of British readers whose outlook on engineering is frankly objective and materialistic. The figures are in keeping with the text.—C. W. M.

Shorter Notices

"Lubricating Oil Tests." By J. E. Southcombe. Pp. 100; figs. 16. London: Germ Lubricants, Ltd. 3s. 6d. This is the fifth edition of a handbook, first published in 1932, that reviews the essential aspects of oil technology and discusses the usual methods of testing, particular attention being paid to the practical significance of each test and its relationship to the lubrication of engines and machinery. Among the new matter are more detailed accounts of refining methods and chapters indicating the latest trends in research, including information published for the first time in connection with the Lubrication Conference last October. The avoidance of chemical terms as far as possible will enhance the value of the book to engineers in charge of plant as well as oil users and oil salesmen.

"Flight Handbook," by W. O. Manning and the technical staff of *Flight*. (Pp. 146; figs. 106.) London: Flight Publishing Co., Ltd. Price 3s. 6d.—This handbook on aeronautics is particularly timely just now. It enables the uninitiated to grasp the theory of aeronautics and its application in design and manufacture. The excellent illustrations are worthy of special mention.

"Aluminium Facts and Figures." (Pp. 190.) London: British Aluminium Co., Ltd.—A wealth of useful information, both tabular and technical, is included in this booklet. The various alloys are dealt with. Castings, heat treatment, melting, soldering, welding and finishing, including the anodic treatment, are given full treatment.

"Proceedings of the Chemical Engineering Group: The Society of Chemical Industry." (Pp. 138; illus.) London: The Society. Price 21s. The volume contains the annual report with lists of officers and committees, and reprints in full of eighteen papers read during 1937.

"Grimsehls Lehrbuch der Physic." Vol. 2. Revised by R. Tomaschek. Pp. 456; figs. 339. Leipzig: B. G. Teubner. Price Rm.14.

Electrical Import Trade of India

Good prospective demand

LAST year electrical imports into India continued their upward movement. From the following table based on the official returns for 1937 it will be seen that all important groups except fans and instruments showed a healthy increase on 1936.

The share of the United Kingdom in this trade was well maintained, although the United States and Holland took the bulk of the growing trade in radio apparatus. Germany was an active competitor generally and Japan made some advance in the smaller apparatus.

The completion of a number of stations has increased the demand for installation and appliances of various kinds, a demand which will extend further as a number of other developments come to fruition. For example, there are schemes for a combined hydro-electric and irrigation development in the State of Hyderabad where 145,000 kW can be generated from two large rivers, and a 2,000-kW power station at the Sandomuti Khan falls, Sind; the Bombay Government has budgeted for a start on the Papanasam hydro-electric scheme and has been investigating a number of extensions in its area; the Government of Bihar contemplates the supply of electricity for industrial and domestic purposes throughout the province; in Mysore another power station is being erected to utilise falls on the River Shimsha, and a 2,000 kW generating station is planned for Darjeeling. The reductions in rates which have been made in Bombay and Surat, and will probably be followed by similar cuts in other supply areas, should result in increased demand for appliances.

	1937 Rs. (000)	Inc. or dec. on 1936 Rs. (000)
Electric fans and parts—		
Total	3,090	− 523
From United Kingdom	1,621	− 999
„ Italy	600	+ 490
„ United States	273	+ 130
Wires and cables, rubber insulated—		
Total	4,148	+ 1,152
From United Kingdom	2,812	+ 695
„ Germany	563	+ 60
„ Belgium	456	+ 267
„ Japan	182	+ 64
Wires and cables, insulation other than rubber—		
Total	5,582	+ 715
From United Kingdom	4,452	+ 462
„ Germany	654	+ 320
„ United States	54	− 185
Telegraph and telephone wires and cables—		
Total	248	− 107
From United Kingdom	178	+ 23
Bare copper wire (electrolytic)—		
Total	1,314	+ 97
From United Kingdom	492	− 139
„ Japan	677	+ 177
Telegraph and telephone instruments and apparatus—		
Total	2,076	+ 165
From United Kingdom	1,524	− 152
Gas-filled electric lamps—		
Total	1,905	+ 114
From United Kingdom	1,145	− 37
„ Holland	294	+ 15
Vacuum electric lamps—		
Total	1,654	+ 347
From United Kingdom	516	− 36
„ Holland	317	+ 69
„ Japan	463	+ 70
Electric lamps for automobiles—		
Total	120	+ 25

	1937 Rs. (000)	Inc. or dec. on 1936 Rs. (000)
Electric bulbs for torches—		
Total	323	+ 11
From Japan	72	− 17
„ United States	218	+ 7
Radio apparatus—		
Total	2,978	+ 485
From Holland	617	+ 408
„ United States	1,361	+ 523
Component parts of receivers, other than valves—		
Total	444	+ 44
Radio valves—		
Total	203	+ 107
From United Kingdom	90	+ 42
„ United States	70	+ 29
Other radio apparatus—		
Total	634	+ 301
Other electric lamps—		
Total	1,518	+ 543
From China or Hong Kong	337	+ 87
„ United States	181	− 27
„ China	317	+ 155
Batteries—		
Total	2,680	+ 341
From United Kingdom	107	− 23
„ United States	1,792	− 18
Electric carbons—		
Total	253	+ 50
Accumulators and parts—		
Total	793	+ 285
From United Kingdom	645	+ 197
Condensers—		
Total	38	− 12
Electric bell apparatus—		
Total	88	+ 33
Electric lighting accessories (including switches)—		
Total	796	+ 104
From United Kingdom	390	+ 13
„ Germany	261	+ 84

	1937 Rs. (000)	Inc. or dec. on 1936 Rs. (000)
Meters—		
Total	1,139	− 73
From United Kingdom	528	− 118
„ Germany	396	+ 14
Other electrical instruments (not telegraph or telephone)—		
Total	640	− 169
From United Kingdom	339	− 100
„ Germany	158	− 114
Electro-medical apparatus—		
Total	581	+ 189
Switchboards (other than telegraph or telephone)—		
Total	407	+ 137
From United Kingdom	373	+ 129
Electrical goods and apparatus not enumerated—		
Total	3,726	+ 733
From United Kingdom	2,146	+ 189
„ Germany	797	+ 268
„ United States	353	+ 114
All electrical apparatus—		
Total	33,962	+ 3,704
From United Kingdom	17,703	+ 111
„ Germany	5,425	+ 1,239
„ Japan	2,268	+ 666
„ United States	3,619	+ 33
Electrical machinery—		
Control and switchgear	5,756	+ 1,128
Generators, alternators and dynamos	3,004	− 470
Motors	3,814	− 16
Transformers	2,484	+ 550
Turbo-generating sets	1,502	+ 539
Other	10,363	+ 1,032
Total	26,924	+ 2,764
From United Kingdom	17,155	+ 118
„ Germany	4,301	+ 550
„ United States	1,731	+ 159

South African Imports

Continued growth

THE recently issued annual volume for 1937 of the external trade of the Union of South Africa reveals a continuance of the improvement in electrical imports. The following table, showing the values of the principal groups, with supplying countries, is based on the official returns, notes of increases and decreases (which are very few) compared with 1936 being added. Although Great Britain's share of the trade as a whole is very satisfactory, it is noticeable that she does not lead in a number of lines, namely, radio, vacuum cleaners, heating and cooking apparatus, self-contained lighting outfits, both primary and secondary batteries and porcelain insulators.

The future of the electrical import trade of the Union appears promising. An extensive programme of public works includes many which involve the purchase of electrical plant, notably those in the gold-mining area. In practically all the large towns building has been very active, and with the spread of electric supply the demand for installation materials and appliances of various kinds should continue large.

	1937. £(000).	Inc. or dec. on 1936. £(000).
Elec. hand lamps—		
Total	24	—
From United Kingdom	3	—
„ Hong Kong	6	—
„ United States	11	+ 2
Elec. lamp bulbs—		
Total	219	+ 23
From United Kingdom	145	+ 9
„ Austria	11	+ 3
„ Germany	11	+ 1
„ Holland	6	− 1
„ Hungary	11	+ 3
„ Japan	9	+ 2
„ United States	21	+ 5
Self-contained lighting outfits—		
Total	61	+ 21
From United Kingdom	15	− 2
„ United States	42	+ 22
Radio apparatus—		
Total	790	+ 144
From United Kingdom	99	+ 7
„ Holland	122	+ 72
„ United States	531	+ 61
Other telegraph and telephone appliances—		
Total	76	+ 23
From United Kingdom	55	+ 11
„ Germany	11	+ 8
„ Sweden	5	+ 1

	1937. £(000).	Inc. or dec. on 1936. £(000).
Vacuum cleaners—		
Total	106	+ 30
From United Kingdom	18	− 5
„ Germany	49	+ 20
„ Sweden	26	+ 9
Cable and wire—		
Total	1,256	+ 145
From United Kingdom	1,090	+ 110
„ Belgium	44	+ 15
„ Germany	80	+ 10
„ Sweden	5	+ 2
„ United States	12	− 1
Heating and cooking apparatus—		
Total	383	+ 73
From United Kingdom	108	+ 15
„ Canada	186	+ 39
„ Germany	25	+ 7
„ United States	48	+ 6
Meters—		
Total	62	+ 11
From United Kingdom	51	+ 7
„ Germany	7	+ 4
Porcelain insulators—		
Total	58	+ 9
From United Kingdom	20	+ 7
„ Canada	35	+ 5
Batteries, primary—		
Total	154	+ 25
From United Kingdom	33	+ 3
„ Germany	4	− 1
„ United States	115	+ 25

	1937. £(000).	Inc. or dec. on 1936. £(000).
Batteries, secondary—		
Total	155	+ 57
From United Kingdom	45	+ 10
„ Germany	9	—
„ United States	98	+ 46
Dynamos and generators—		
Total	132	+ 30
From United Kingdom	95	+ 27
„ Germany	6	+ 1
„ Sweden	4	− 7
„ United States	23	+ 7
Motors—		
Total	556	+ 163
From United Kingdom	372	+ 85
„ Germany	25	+ 4
„ Sweden	56	+ 26
„ United States	72	+ 35
Transformers—		
Total	345	+ 50
From United Kingdom	230	+ 10
„ Germany	40	+ 4
„ United States	38	+ 16
Other electrical machinery and appliances—		
Total	2,064	+ 314
From United Kingdom	1,521	+ 148
„ Canada	8	+ 6
„ Austria	13	+ 6
„ Germany	203	+ 58
„ Sweden	16	− 7
„ Japan	6	+ 3
„ United States	245	+ 87

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Catering at the Royal Show

As stated in our last week's issue, all the catering at the Royal Agricultural Society Show at Cardiff was carried out electrically. In addition to the G.E.C. and Burco equipment mentioned, six cookers, three hot cupboards, a boiling table, twelve 10-gal. boilers and a 6-gal. coffee urn supplied by the Jackson Electric Stove Co., Ltd., were used, as well as various Moffat heavy-duty cooking apparatus and Stott electric counter sets for water boiling. About a hundred 10-gal. wash boilers and thirty domestic cookers were supplied by the Cardiff Corporation Electricity Department to the smaller cafés and breed societies' pavilions, besides a large number of electric kettles throughout the showground. Hotplates lent by the G.E.C., Simplex and Revo were used in the herdsmen's messrooms. A 200-kW Bastian & Allen steam boiler provided the steam for the official dairy, while Santon, Ltd., was responsible for the water heating in the Royal Pavilion and the Stewards' Pavilion. Lighting fittings were lent by Falk, Stadelmann & Co., Ltd., and the G.E.C. for the Royal Pavilion and the Lord Mayor's Parlour. The main electricity supply to the showground was given by a 6,600-V ring main feeding five substations through ring main isolators. There were ninety low-voltage services and the total length of the cable installed was 5¾ miles underground and 300 yds. overhead.

Registered Electrical Contractors

Applications from the following for registration were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Hamman, E., Walkden, Nr. Manchester.
Crankshaw, J. W., Sale, Nr. Manchester.
Lunt, H., Chorlton-cum-Hardy, Manchester.
Wild & Steele, Ltd., Headington, Oxford.
Waudby, C., Hull.
Freeman Electrical Co., London, E.1.
Job, E., London, S.E.1.
MacLaren, G. K., Brooklands, Manchester.
Carter, J. C., Dorking.
Henfrey (Electrical), Ltd., Edgware.
Andrews, J. H., London, W.1.
Kilpatrick, R., & Co., Ltd., Dundee.
Banbury & District Electric Supply Co., Ltd., Halesowen.
Cornwall Electric Power Co., Carn Brea, Cornwall.

At the same meeting one application was withdrawn and three were declined.

Lighting Bureau Reconstruction

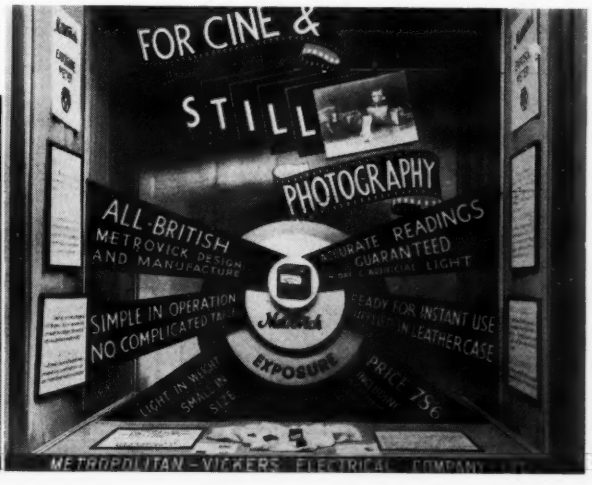
The E.L.M.A. Lighting Service Bureau at Savoy Hill, W.C.2, is undergoing one of its periodical reconstructions prior to the beginning of the 1938-39 lighting season. One of the principal improvements will be an extension of the lecture theatre to accommodate considerably larger audiences.

Two Window Displays

The accompanying illustrations show two displays arranged by the British Thomson-Houston Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd., in their windows in Aldwych, London, W.C.2. The illustration on the left shows a Mazda "Regulation" headlight bulb display. The anti-dazzle flat topped beam provided by this new headlight bulb is emphasised by a pictorial background. This bulb, when correctly set, focused and maintained in an ordinary non-dipping headlamp, complies with M.O.T. regulations.

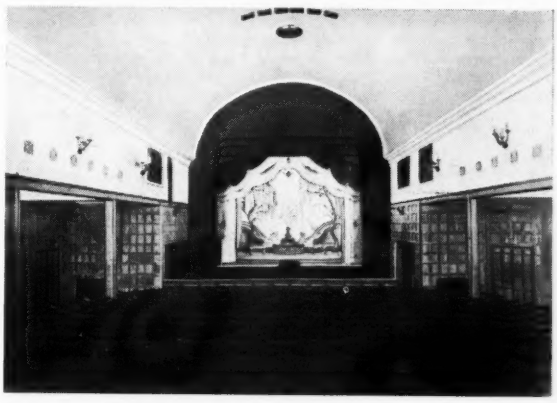
An interesting development of electrical instrument making is the photo-electric type of exposure meter which is rapidly gaining favour with photographers. The illustration on the right "puts over" all the attractive points of the new "Metro-vick" model. Included in the display are extracts from Press reviews which add conviction to the sales points featured.

Two effective window displays in Aldwych, London, W.C., by the B.T.H. Co. and the Metropolitan-Vickers Electrical Co., Ltd.



Lighting for the Glyndebourne Festival

The Glyndebourne Opera Festival which ended last Saturday is held annually in a theatre constructed in an old country mansion surrounded by beautiful gardens and situated amid some of the most glorious natural surroundings in this country. An innovation in the lighting was introduced at Ringmer this



The auditorium of the theatre at Ringmer where the Glyndebourne opera is held

year. A large number of extremely powerful lamps were supplied by the Ringmer Motor Works, Ltd., suitable for the spot lanterns supplied by Messrs. W. J. Furse & Co., Ltd., of Nottingham, to meet the stage and bridge lighting requirements of Mr. J. Christie, who is responsible for the arranging of the Festival. Ten of the lamps were arranged above the roof for lighting the stage through apertures in the ceiling, while four were installed on the first bridge directly over the proscenium. These were rated at 2,000 W each, and were of the type known as "Osram Bi-Post" lamps, made by the General Electric Co., Ltd. They are similar to those used for cinema production purposes in studios, and give an extremely accurate control without the need for expert focusing. The special cloud apparatus used at this theatre has been equipped with lamps of similar type. This is believed to be the first occasion on which such high powered lamps have been installed for stage productions in this country other than in film studios. Their life is of the order of one hundred hours.

Australian Electrical News

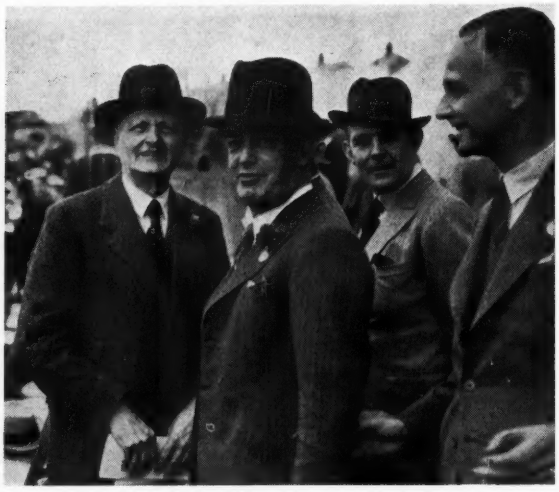
Our Australian correspondent reports that Government Ordinance 54A prohibiting the sale of certain types of electrical apparatus unless approved of by the Electrical Safety Committee comes into force shortly throughout New South Wales. Somewhat similar legislation is already in force in Victoria, but a difference exists in the methods of approval of apparatus. In Victoria, apparatus is approved as a result of actual tests on apparatus submitted to the authorities, whereas in New South Wales a guarantee number will be supplied to

any manufacturer who undertakes to manufacture to the required standard, irrespective of whether actual apparatus is tested or not. As the control of quality and design is in the interests of public safety, it is considered by many that such a matter of national concern should be controlled by a national body.

The report of Messrs. B. Hellstrom and A. Samsoie on the electrical resources of New South Wales will be placed before the State Cabinet shortly and will afterwards be tabled in Parliament. No official comment will be made until the Cabinet has considered the report fully, but it is understood that the experts do not favour the formation of an electricity commission. Various methods for the co-ordination of the power-generating authorities of the State are to be suggested.

Crompton's Diamond Jubilee

Even the rain that perisisted through most of the afternoon could not damp the enthusiasm of 2,500 Crompton Parkinson employés who were present on July 9th at the garden party given to celebrate the sixtieth anniversary of Cromptons. The party was held by Crompton Parkinson, Ltd., on the company's sports ground at Chelmsford. Among those present were Mr. and Mrs. Frank Parkinson, Mr. and Mrs. A. Parkinson, Mrs. Parkinson, senior, Mr. and Mrs. Fox, Mr. Holroyde and Colonel Hardie. Colonel Crompton, who was unable to attend, sent a telegram of regret. The programme



A group at the Crompton Parkinson garden party including Mr. F. Parkinson, Mr. B. H. Garside (general manager of Crompton Cables), and Mr. T. H. Windibank (general sales manager)

began with the finals of the annual Crompton sports. After these had been completed, a fun-fair, the proceeds of which went to charity was opened. Tea was served in a large marquee. The sports prizes were presented by Mrs. Frank Parkinson, and this was followed by presentation of long-service awards to Crompton employés, by Mr. Albert Parkinson. Over 950 awards have been made, 550 of which have been received by Chelmsford employés for periods of service ranging from 10 to over 40 years. In addition to silver and gold medals, those with more than twenty-five years service received gold wrist watches, and those with over forty years, gold half-hunter watches. In the last category there were fifty employés. A special medal was struck for R. E. Crompton & Co.'s founder, Colonel Crompton. As a token of regard for Mr. Parkinson, members both of the staff and the works organised a collection, and a cheque from each section was handed to Mr. Parkinson to be sent to suitable charities.

Mr. White, in presenting the works cheque, drew attention to Mr. Parkinson's care for the welfare of his personnel, and pointed out that such innovations as holidays with pay, the 45-hour week, and the superannuation scheme, which Mr. Parkinson had introduced, had done much to increase not only the amenities but also the security of those with Crompton Parkinson. Mr. Parkinson, in reply, said that by the superannuation scheme, it was hoped that every employé would be able to retire and receive at least half salary at sixty. Towards this end, over £110,000 had already been put aside. In addition, a further £27,000 had been reserved for the express purpose of assisting in any cases of distress of workers or their dependents. An entertainment by "The Roosters" concert party followed, and at 10.15, the day's programme concluded with a display of fireworks.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the cost of living on June 1st (55 per cent. above the 1914 level) will not involve any alteration in wages on the third pay day in July.

Holidays with Pay

Tungstalite, Ltd., has decided to grant summer holidays with pay to all its employés. This announcement was made at luncheon during the annual outing of the employés which was held recently at Southend-on-Sea. The sports committee arranged an excellent programme of games and competitions.

The Dutch Electrical Market

According to a Department of Overseas Trade report on economic and commercial conditions in the Netherlands (H.M. Stationery Office, 1s. 6d.) the electrical industry has weathered the recent financial and economic crisis remarkably well and has also launched out into new fields. Production of vacuum cleaners is steadily rising and ten works are now engaged in this industry. In 1936 there were 61,350 cleaners produced (15,250 more than in 1935) and 4,660 exported (1,200), imports totalling 27,260. Exports of meters, resistances and heating apparatus increased by 50 per cent. The value of radio goods exported rose from 34,437,000 to 52,654,000 guilders and that of electric lamps from 5,586,000 to 7,377,000 guilders. Regarding trading conditions generally, the report states that the effect of devaluation of the guilder in September, 1936, gave a further impetus to an already recovering business, but the revival lasted only until the middle of the year. Conditions at the end of the year compared favourably with those obtaining a year before, but prospects are not bright. Trade with the United Kingdom has increased.

Lancashire Electrical Contractors

At recent meetings of Lancashire branches of the E.C.A. consideration has been given to the terms on which some municipal authorities undertake hire-purchase business. It was alleged at one meeting that a Corporation supplied electrical appliances at a charge as low as 2½ per cent. on the cash price, which placed it in a better position than the private retailer to get orders for apparatus. This matter also engaged attention at the recent annual conference of the National Federation of Ironmongers, which passed a resolution of protest. It is understood that when the views of the various branches have been co-ordinated a group meeting of electrical contractors to consider this special topic is to be held at Blackpool. Contractors who have ideas on how to correct the trouble of under-cutting on hire-purchase will read papers.

Annual Holidays

The works and offices of the Telephone Manufacturing Co., Ltd., will be closed from midday on July 23rd until August 3rd for the works holiday.

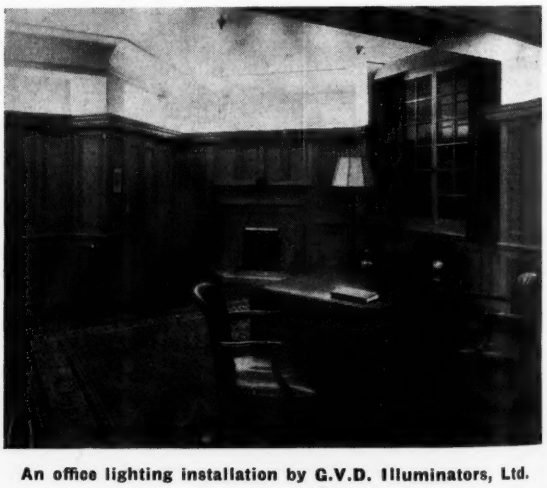
Wm. Sanders & Co. (Wednesbury), Ltd., announce that their works will be closed for the annual holiday from midday on July 30th to August 8th.

The works of the Darlington Forge, Ltd., will be closed from July 30th to August 6th.

The Engineering and Lighting Equipment Co., Ltd., is closing its works from July 23rd to August 2nd.

An Office Lighting Installation

The chairman's office of Sangers, Ltd., Tolmers Square, N.W.1, contains an excellent example of cornice lighting by G.V.D. Illuminators, Ltd. Lamps are spaced at 3 ft. and the



An office lighting installation by G.V.D. Illuminators, Ltd.

even lighting obtained is clearly seen in the accompanying picture. Consumption is said to be considerably less than would be necessary with any other system.

Orders Recently Booked

The English Electric Co., Ltd., has recently received important contracts from the London Passenger Transport Board in connection with the electrification of the Northern and Elstree extensions of the Board's North London Railway line. The contracts comprise ten supervisorily controlled rectifier substations and include twenty-one 1,500-kW steel-tank mercury-arc rectifiers, 11-kV switchgear, power transformers, d.c. switchgear, low-voltage a.c. switchgear, remote supervisory control gear and cables.

Trade Announcements

The General Electric Co., Ltd., announces the opening of a new sales depôt at 72-74, Castle Street, Reading (telephone: Reading 3237/8). Ample stocks of G.E.C. products and materials will be carried at this address and delivery vans will cover Oxford, Newbury, Aldershot, Windsor, High Wycombe and intervening towns three times a week. The depôt will serve the whole of Berkshire and Oxfordshire, as well as small parts of Surrey, Hampshire and Buckinghamshire. Mr. L. F. Mills has been appointed manager.

The McKinlay Electrical Mfg. Co., Ltd., 75, Upper Richmond Road, Putney, S.W.15, has taken over the manufacture and sales of the "Gambrell Deskphone."

Gaston E. Marbaix, Ltd., Humglas House, 23, Carlisle Place, London, S.W.1, European direct factory representatives of the Titan Tool Co., U.S.A., announce the introduction to this country and the Continent of the range of Titan tools well known in American machine shops, factories and garages. The company sent us illustrated pamphlets describing three types of stud setter.

The Beckenham Electrical Co., Ltd., has commenced business as installation and maintenance engineers at offices and works at 96, High Street, Beckenham, and asks for wholesalers' and manufacturers' catalogues, &c.

For Sale

Halifax Electricity Department invites offers for scrap materials.

(See our classified advertisements.)

Electrical Appliance Sales Aids

To link up with their national advertising campaign, Bulpitt & Sons, Ltd., have prepared a number of sales aids for dealers who stock the "Swan" brand of electrical appliances. The range includes display stands, window banners, showcards, overprinted sales literature, and appliance stands, and the company is distributing a "dealer aids book" which illustrates and describes the material available. This can be obtained on application to the company (Department E1) Camden Street, Birmingham, 1.

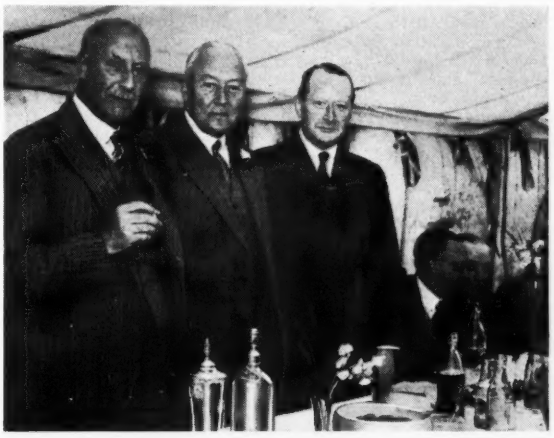
Works Visits

A party of twenty-two from Central London Electricity, Ltd., visited the Belvedere factory of Callender's Cable & Construction Co., Ltd., on July 8th. The journey was made by coach in time for lunch at the works and during the afternoon the visitors, in small groups with expert guides, saw the manufacture of cables from stranding to armouring and packing, and also inspected the engineering shops. Tea was provided, when thanks were expressed to the company and officials.

Members of the N.W. branch of the Association of Mining Electrical Engineers, numbering 120, visited Callender's Anchor Works at Leigh on July 9th. Special arrangements had been made for representative units of the plant to be run in each department to demonstrate the various processes of rubber cable manufacture. Members of the works technical staff acted as guides. Colliery cables of all types were seen in various stages, also manufacture of the large ring main for the *Queen Elizabeth*. A demonstration was given of locating faults and the repair of colliery trailing cables. Tea was provided in the canteen, and later the party had the choice of bowls on the works green or a show of films in the canteen.

Social Events

Welcoming the teams of the Yorkshire Electric Power Co. on July 9th, Mr. C. D. Taite, engineer and manager of the Lancashire Electric Power Co., remarked that it was an added pleasure to entertain their visitors this year, as it was the first occasion on which either side had been able to receive its opponents at a Club House and ground of its own. The L.E.P. Club Centre had been open less than three years and fine progress had been made. Sir Joseph Nall, M.P., recalled his association wilth Mr. Woodhouse and the Y.E.P. in Parliamentary affairs in connection with the 1926 Act. Mr. W. B. Woodhouse responded, expressing great appreciation of the hospitality extended to them. Cricket commenced promptly after lunch,



The Y.E.P. teams being entertained to lunch by the L.E.P. at the annual sports. Standing (left to right) Mr. C. D. Taite, Mr. W. B. Woodhouse and Sir Joseph Nall, M.P.

and on a wet wicket the L.E.P. scored 104. The Y.E.P. had scored 79 runs for five wickets when stumps had to be drawn. At tennis the Y.E.P. were successful by 11 matches to six, but at shooting the L.E.P. came out on top, winning by a single point. The Y.E.P. bowls team made a total of 284 against the L.E.P.'s 256. The official party included Mr. and Mrs. W. B. Woodhouse, Sir Joseph and Lady Nall, Mr. C. D. Taite, Col. and Mrs. Fraser, Mr. S. R. Siviour, Mr. and Mrs. J. W. Chant, Mr. and Mrs. R. C. Leslie and Mr. and Mrs. S. M. Rix.

The annual works and staff outing of William McGeoch & Co., Ltd., was held on July 2nd. About 250 members travelled by special train to Totnes (Devon) where lunch was served. They then had a two hours' sail down the River Dart to Kingswear, where they rejoined the special train going on to Torquay where the rest of the afternoon was spent. Breakfast and supper were served on the train. Mr. P. McGeoch accompanied the party, but Mr. W. McGeoch sent an apology for unavoidable absence.

The annual inter-works sports of the English Electric Co., Ltd., were held at Bradford on July 2nd when over 1,000 employés of the Stafford, Rugby and Preston works visited their colleagues at the company's Bradford works. There were over 3,000 spectators on the sports field and excellent weather again favoured the meeting. After inspecting the Bradford works the visitors were entertained to lunch in the canteen, and during the afternoon and evening representatives of the four

A group at the English Electric Sports. Seated (left to right) Messrs. J. P. McMurray (chief works accountant), E. B. Banks (acting general manager, Preston), A. Winterbottom (director), Mrs. L. J. Sarjeant, Mr. J. Rogers (general manager of works), Mrs. G. H. Nelson, Mr. B. H. Nelson (chairman and managing director), Mrs. J. Rogers, Mr. L. J. Sarjeant (manager, Bradford), Mrs. P. Norwood, Mr. R. R. Parker (general manager, Rugby) and Mrs. J. P. McMurray. Standing at the back are a number of the company's other officials.

works competed in a variety of contests embracing almost every indoor and outdoor sport. Mr. L. J. Sarjeant, manager at Bradford, welcomed the visitors, and Mr. G. H. Nelson, the chairman and managing director, after making reference to the excellent position of the company's order book, thanked all present for all they had done in its interest. Mrs. L. J. Sarjeant presented the prizes to the captains of the various teams and to the winners of the novelty events. Among the many trophies presented was a cup for swimming presented by Mr. J. Bissett, the late general manager of works, who recently left the company.

On July 2nd a party of approximately 100 of the staff and employés of Aberdare Cables, Ltd., went on their first annual outing to Weston-super-Mare. The party travelled from Aberdare to Cardiff by motor coach and thence by steamer to Weston. During lunch at the Beach Hotel a message was read from Mr. T. Elder, works manager, regretting his unavoidable absence. A telegram was sent to the chairman of the company, Mr. G. C. Usher, expressing the employés' good will and best wishes.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price July 13th	Fortnight's Inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac... ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/3 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£179	£25 inc.
Grade II ... ... ,,	£127	£15 inc.
Grade III ... ... ,,	£73	£6 inc.
c Brass (rolled metal 2" to 12" basis) ... per lb.	7¾d.	¼d. inc.
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11½d.	¼d. inc.
c ,, Wire, basis ... ... ,,	8½d.	¼d. inc.
c Copper Tubes (solid drawn)... ... ,,	1/0¼d.	¼d. inc.
g ,, Bars (best selected)... ... per ton	£74	£2 inc.
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£43 15s.	£1 10s. inc.
d ,, ,, WireRods ... ... ,,	£48 5s.	£1 10s. inc.
d ,, ,, H.C. Wire ... per lb.	7¾d.	⅛d. inc.
f Ebonite Rod ¼" dia. & up ... ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	7d.	¼d. inc.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1 P.O. Qual. ... ,,	£23	—
g Lead, English Pig ... ... ,,	£16 10s.	—
g Mercury ... ... per bot.	£13 10s.	—
e Mica (in original cases) small ... per lb.	10d. to 2/-	—
e ,, ,, ,, medium ... ,,	6/- to 12/6	—
e ,, ,, ,, large ... ,,	13/- to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/0¼d.	¼d. inc.
p ,, ,, rolled strip & sheet ,,	10½d.	¼d. inc.
p ,, ,, wire ... ... ,,	1/0½d.	¼d. inc.
o Platinum ... ... per oz.	£7 5s. 0d.	12s. 6d. inc.
d Silicium Bronze Wire ... ... per lb.	8 ⅝d.	¼d. inc.
g Spelter ... ... per ton	£13 12s.6d.	7s. 6d. inc.
g Tin, Block (English)... ... ... ,,	£189	£3 15s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

New Catalogues and Lists

Hackbridge Electric Construction Co., Ltd., Walton-on-Thames.—Publication D.B.21 illustrating and describing an automatic voltage booster.

British Central Electrical Co., Ltd., 6 and 8, Rosebery Avenue, London, E.C.1.—Details of the new "Super Gripper" hand-lamp.

Norman Turner & Engineering Co., Ltd., 121, Victoria Street, London, S.W.1.—Details of "Ilg" air conditioning equipment and "Delco" blowers.

F. H. Pride, Ltd., 69-81, Clapham High Street, London, S.W.1.—A well-illustrated art catalogue of lighting equipment of all kinds.

A.E.G. Electric Co., Ltd., 131, Victoria Street, London, S.W.1.—A catalogue of domestic and industrial equipment available in this country.

Bennie Lifts, Ltd., 2, Tinworth Street, Albert Embankment, London, S.E.11.—A leaflet dealing with a new service lift.

Bankruptcy Proceedings

S. Barnard, lately carrying on business as Philip Barnard & Co., radio, electrical, and domestic appliance dealer at 42, Maiden Lane, London, W.C.—The public examination of this debtor was held on July 6th at the London Bankruptcy Court before Mr. Registrar Kean. Replying to the Official Receiver debtor agreed that her statement of affairs showed liabilities of £605 and there were no assets. The examination was concluded.

J. V. Wilson, electrical contractor, 20, High Street, Bromsgrove.—Trustee, Mr. F. E. Bendall, Midland Chambers, Warwick Passage, Corporation Street, Birmingham, released June 21st.

A. Reid, radio specialist, 1, Bridge Street, Neston.—First and final dividend of 3s. 2¾d. in the £, payable July 14th at Government Buildings, Victoria Street, Liverpool.

J. H. Metcalf, radio dealer, 82, Clivedon Avenue, Perry Barr, lately trading at 261, High Street, Smethwick, and carrying on business lately at 171, Summer Lane, Birmingham.—First and final dividend of 8d. in the £, payable July 14th at 159, Great Charles Street, Birmingham.

R. R. French (Radio Electrical Services), **radio dealer,** Chandos Place, St. Austell.—Last day for receiving proofs for dividend, July 18th. Trustee, Mr. C. Hancock, 12, Princes Street, Truro, Official Receiver.

L. C. Wright, radio dealer, Dalton, Beechley Road, Wexham, lately trading at Chester Street, Mold.—First and final dividend of 11½d. in the £, payable July 15th at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester.

J. O. Storey (J. Storey & Son), electrical engineer and radio dealer, 227, Stockport Road, Ashton-under-Lyne.—Receiving order, dated May 24th, 1933, rescinded, adjudication order dated May 24th, 1933, annulled, and petition, filed May 24th, 1933, dismissed, it appearing to the Court that the debts have been paid or provided for in full.

W. N. Smith, radio dealer, 18, King Street, Dudley.—Public examination August 4th at the Court House, Dudley.

R. D. Farrant, radio dealer, 196, Archway Road, Highgate, N., lately trading at rear of 543, Holloway Road, London.—Application for discharge to be heard on July 27th at Carey Street, W.C.2.

A. F. Gunstone (deceased), radio dealer, late 26, The Market Place, Westbury.—Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver, released June 23rd.

G. W. Linsell, radio and electrical engineer, Tippendale Lane, Park Street, near St. Albans, lately trading at 26, London Road, St. Albans.—Last day for receiving proofs for dividend, July 19th. Trustee, Mr. F. E. Bendall, 4, Charterhouse Square, E.C.1.

J. B. Clements, radio and electrical engineer, 85, Church Street, Tewkesbury.—Receiving order made July 5th on debtor's own petition.

A. S. Deacon, wireless dealer, 32, London Road, Derby, and 127, Pear Tree Road, Derby, trading as the London Wireless Co.—This debtor was granted his discharge on July 6th at the Court House, 20, St. Peter's Churchyard, Derby. It was stated that the debtor failed in May, 1931, with liabilities of £2,283 and assets of £442.

Company Liquidations

A. & H. Thompson Bros., Ltd., electrical engineers, 2, Clock House Parade, Palmers Green, London, N.13.—A meeting of creditors was held recently at Southern House, Cannon Street, E.C., when a statement of affairs as at June 17th last was submitted showing gross liabilities of £3,082. The total assets were £2,879, the estimated loss from February 1st, 1938, to date being £203. It was reported that a debenture was issued on May 13th last as security for cash advanced, and on June 17th the debenture holder appointed Mr. W. J. Castle, of Bank Chambers, 164-166, Rushey Green, Catford, S.E., as receiver, and he was now realising the assets. It was not anticipated that the assets would realise anything like the amounts shown in the statement of affairs. It was stated that the balance of the vendors' account amounting to £420 would be withdrawn. The creditors decided to confirm the voluntary liquidation of the company with Mr. W. J. Castle as liquidator, with a committee.

Frank Johnson & Co. (Worcester Park), Ltd., electrical engineers, Dacre House, Victoria Street, London, S.W.1.—The statutory meeting of creditors was held on July 4th when a statement of affairs was submitted which disclosed liabilities of £3,356, due to fifty unsecured creditors. The net assets were £2,152, leaving a deficiency, so far as the creditors were concerned, of £1,204. It was stated that the principal creditors had been investigating the position and at one time there was a possibility of a moratorium being granted. Several creditors had, however, dissented to that arrangement and there was no alternative but for the company to go into voluntary liquidation. A resolution was passed confirming the voluntary liquidation of the company, with Mr. F. H. Parrott and Mr. J. H. Senior as joint liquidators. A committee was also appointed.

Surrey Wholesale Electrical Co., Ltd.—In view of the amalgamation of the company with the Alliance Wholesale, Ltd., 62, Great Russell Street, W.C.1, the company is winding up voluntarily, and Mr. A. E. Sharman, 3, Sherwood Park Road, Sutton, has been appointed liquidator.

(A notice of the amalgamation of these two companies appeared in our last issue, page 60.)

Tubelight Sales, Ltd.—Particulars of claims by August 1st to the liquidator, Mr. W. E. Ridsdale, 4, London Wall, E.C.2.

(As announced in our last issue, Maple & Co., Ltd., will continue to manufacture "Barlux" tubelamps and all sales formerly handled by Tubelight Sales will be dealt with by them.)

British Electric Domestic Appliances, Ltd.—Particulars of claims by August 2nd to the liquidator, Mr. C. Latham, 185-188, High Holborn, W.C.1.

Radio Services (Porthcawl), Ltd.—Winding up voluntarily. Liquidator, Mr. J. W. Williams, 5, St. Andrew's Crescent, Cardiff. Particulars of claims to the liquidator by August 16th.

Kiesow & Co., Ltd.—Meeting August 8th at 87, Bishopsgate, E.C.2, to receive an account of the winding-up by the liquidator, Mr. C. S. Beale.

Electricity Supply

Lighting, Domestic, Power

Barnstaple.—DEVELOPMENTS.—Authority has been given to the borough electrical engineer to extend the supply of electricity to Raleigh. The Town Council has also approved a plan for improvements in the public lighting of Taw Vale, Newport Road, and Landkey Road.

Barnsley.—LOANS.—The Electricity Committee is seeking sanction to borrow £5,000 for hired wiring and £20,000 for mains and services.

Barrow-in-Furness.—STREET LIGHTING.—Improvements in street lighting to be carried out by the Electricity Committee are estimated to cost £1,420.

EXTENSIONS.—The Committee is to lay underground cables to Biggar, at a cost of £3,260, and also extend the supply to Cross-a-Moor, Pennington (£291). An extension to Tottlebank, Greenodd, is under consideration.

Bellshill.—INDUSTRIAL DEVELOPMENT.—New cables are being laid by the Clyde Valley Electrical Power Co. to meet the demand for power supplies following industrial development in the area. Among the new works are chemical plant at Mossend for Imperial Chemical Industries, and the new steel works which Colville's, Ltd., are establishing on the site of the old Mossend steel works.

Blackpool.—STILL MORE EXTENSIVE ILLUMINATIONS.—Work is in progress on this year's illuminations, which begin on September 16th and end on October 24th. An increase of £4,000 in the Corporation grant has made possible a number of new features, and the augmented programme includes the conversion of an extended carriageway into a brilliant "Cherry Blossom Lane"; the introduction of "Neptune and His 47 Lovelies," a series of models which will surmount the three-quarters of a mile colonnade wall from Cocker Street to Gynn Square; several new tableaux on Bispham Cliffs; "Welcome" arches at Squires Gate, Preston Road, and Poulton New Road; more effective Town Hall and Talbot Square decorations; and a quarter-mile "Norway" set at the South Shore open-air bath from which will pour 12,000 gallons of water per minute in glittering mountain cascades.

Chichester.—LOAN.—Application is to be made for consent to the borrowing of £3,779 to cover the cost of providing an electricity supply to the small holdings of the Land Settlement Association, Ltd., at Sidlesham and Earnley.

Colchester.—DISTRIBUTION SCHEMES.—The Town Council is to improve the low-voltage a.c. distribution in the centre of the town at a total cost of £1,523, including the laying of new cable and new pillars and link boxes. In order to increase the capacity of the extra high voltage system in the south west portion of the area, the Council is to erect a line from the borough ring main at Berechurch to a point near Layer Brook, and lay underground cable from the Hythe generating station to the junction of Whitehall and Old Heath Roads. The estimated cost is £1,970. To promote reliability of supply in the central area of the town, a scheme is to be put in hand involving the laying of a 6,600-V cable from the North Hill sub-station along High Street to the Town Hall and connecting it to the existing cable in West Stockwell Street; and the provision of a second 500 kVA transformer in the North Hill sub-station. The estimated cost is £1,174. The system of supply in the Hythe Quay district is to be altered from d.c. to a.c. at a cost of £5,188. A supply is to be furnished to the Maldon Wood district, Weeley, by the provision of a regulator and an extension of low voltage mains at an estimated cost of £250. A scheme for supplying electricity to Fingringhoe Mill involves an expenditure of £1,164.

Darwen.—NEW CHARGES.—The Corporation has introduced a new scale of electricity charges to become operative from the end of the June quarter. For domestic lighting over 30 kWh the price is reduced to 4d. per kWh, and in excess of 300 kWh to 3½d. For heating and domestic appliances a summer-time concession is granted for all electricity over 300 kWh, the charge being reduced from ⅝d. to ½d. per kWh, and power for industrial purposes from ¾d. to ⅝d. for all electricity in excess of 4,000 kWh. Late shop-window illumination charges are lowered from 2d. to 1½d. per kWh. The rateable value scheme is remodelled and simplified. The concessions will cost the Department £2,000 per annum.

Doune (Perthshire).—ELECTRIC STREET LIGHTING.—A recommendation of the Lighting Committee to purchase forty electric lamps for street lighting, including eight electric-discharge lamps, has been adopted by the Town Council.

Dover.—CABLES.—Approval has been given by the Electricity Committee to an application received from the General Post Office for a 400-V, three-phase, four-wire, 50-cycle supply to the repeater station at St. Margaret's Bay. The estimated cost is £1,333, and the annual revenue £256.

Dundee.—PAYMENT FOR INSTALLATIONS.—Council house tenants who installed electricity at their own expense are now to receive an *ex gratia* payment of £3, although the Housing Committee of the Corporation recommended that no payment should be made. It was maintained that none of the wiring was the Corporation's property until it had paid for it. The Town Clerk gave it as his opinion that if they as a Council decided to compensate the tenants they were entitled to do so.

Eccles.—APPARATUS FOR HIRE.—The Electricity Committee is seeking permission to borrow £10,000 for consumers' apparatus for hire.

Grimsby.—RURAL EXTENSIONS.—Stenigot, Donington-on-Bain, and Tathwell are the latest villages to which a supply of electricity is to be provided by the Electricity Department. An 11-kV underground cable, costing £11,890, will be laid from the sub-station at Legbourne.

India.—FURTHER EXTENSION OF PYKARA SCHEME.—The Governor of Madras recently performed the opening ceremony of the Mukurti Dam, in the Nilgiris, which marks the completion of a further stage in the Pykara hydro-electric project. The Mukurti reservoir brings the effective capacity of the whole plant up to about 35,000 kW. Owing to the unexpectedly rapid increase in the Pykara load, the building of the dam was pressed forward as fast as possible. The total cost of the extension was Rs.15½ lakhs.

Lichfield.—EXTENSIONS.—The Electricity Committee is to carry out extensions to supply Low Farm and Upfields Farm, Elford.

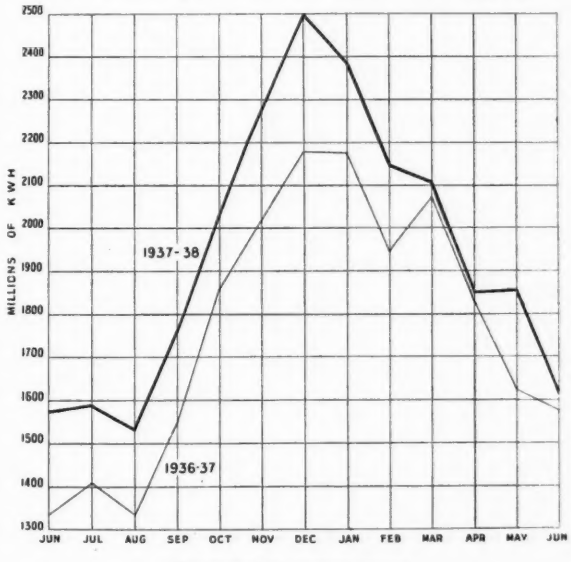
Liverpool.—LIFTS FOR HOUSING ESTATES.—Mr. L. H. Keay, director of housing, has submitted a report on the installation of lifts in municipally owned flats. Referring to one block of flats, he states that if it were decided to install a lift the weekly charge would be 3½d. per tenant.

New Zealand.—POWER BOARD'S SUCCESSFUL YEAR.—The report for the year ended March 31st last, which we have received from Mr. E. F. Hollands, engineer and general manager of the Hutt Valley Electric Power Board, shows that the rate of development was considerably higher than in recent years, sales advancing by 27 per cent. to 31.2 million kWh. The following interesting statistics are given: Population, 48,200; consumers, 13,488; ratio of consumers to population, 28 per cent.; sales per consumer, 2,308 kWh; capital outlay per consumer, £29.9; consumers per route mile of line, 44; connected load per consumer, 4.27 kW; capital outlay per route mile of line, £1,329.7; revenue per kWh sold, 0.97d.; cost per kWh sold, 0.805d. (working cost 0.646d., capital charges 0.159d.); annual load factor, 64 per cent.; number of electric ranges connected, 2,531; and number of water heaters, 2,412.

Portsmouth.—INCREASED CHARGES.—A recommendation has been passed by the Electricity Committee that the quarterly charges under the tariff applicable to premises in the city shall be increased by 1s., and in the case of premises outside the city by 1s. 3d.

Generation of Electricity in June

OFFICIAL returns rendered to the Electricity Commissioners show that 1,612 million kWh was generated by authorised undertakings in Great Britain during June, as compared with the revised figure of 1,574 million kWh in the corresponding month of 1937, representing an increase of 38 million kWh, or 2.4 per cent. The number of working days in



Comparative output curves

the month (*i.e.*, excluding Sundays and Bank Holidays) was twenty-five as against twenty-six last year.

During the six months of 1938 up to the end of June the total amount of electricity generated by authorised undertakings was 11,953 million kWh, as compared with the revised figure of 11,222 million kWh for the corresponding period of 1937, representing an increase of 731 million kWh, or 6.5 per cent.

Seaham Harbour.—SUPPLY TO HOUSING ESTATE.—Application is being made by the Urban District Council for sanction to a loan of £4,600 for the installation of electricity on the Parkside housing estate.

Stalybridge.—POWER STATION EXTENSIONS.—The Corporation has passed plans submitted by the Stalybridge, Hyde, Mossley, and Dukinfield Transport and Electricity Board for extensions at the Hartshead generating station.

ELECTRIC STREET LIGHTING.—It is proposed to provide electric street lighting on the Brushes estate, the cost being £270.

Stourport.—OVERHEAD LINE.—The Urban District Council is raising no objection to a proposal of the S.W. & S. Electric Power Co. to erect overhead lines from the power station at Stourport to Kidderminster.

Swansea.—METER TESTING.—Mr. J. W. Burr, the borough electrical engineer, reported to the Electricity Committee last week that in order to comply with the Electricity Supply (Meters) Act, 1936, which came into operation on July 1st, a second test apparatus would be necessary, with additional staff. The total number of meters in use was 60,000, and, in addition, 5,000 were issued annually.

Tonbridge.—FIRST OVERHEAD LINE.—Agreement has been reached with landowners affected by the proposed extensions to Tudeley Hale. The estimated cost of the overhead line and low-voltage mains, with transformers, &c., will be £1,303, after allowing for contributions from consumers. This will be the first overhead line in the Council's area.

Turton.—IMPROVING THE SUPPLY.—An expenditure of £7,853 on extensions to cables, kiosks, &c., has been sanctioned by the Council. Councillor W. Meredith, chairman of the Electricity Committee, expressed the hope that when the scheme was completed some of the difficulties in certain parts of the area of supply would be remedied.

United States.—FARM SUPPLIES.—In his presidential address to the sixth annual convention of the Edison Electric Institute at Atlantic City last month Mr. C. W. Kellogg said it was the practice of some Government officials to disparage the progress of rural electrification in the United States. In reality they had been making long strides in recent years, and about 1,300,000 farms were now taking supplies, or 20.2 per cent. of the total with occupied dwellings. In Rhode Island 95 per cent. of the farms were connected, and in California 90 per cent. In Great Britain it was estimated that at the end of 1937 7 per cent. of the farms had electric services. Comparison should only be made between appropriate sections of the U.S.A. and such compact countries as Holland and Denmark, and on this basis, both in regard to electrified farms and total electrification, the United States was ahead of other countries. Moreover, with an average use in excess of 1,000 kWh per farm annually, the United States held unquestionable leadership. In European countries, judging from miscellaneous reports, consumptions of 200-300 kWh a year were very general.

Uttoxeter.—LOAN FOR DEVELOPMENT.—The Urban District Council has decided to apply for a loan of £12,040 for its electricity undertaking. Of this sum £6,000 is required for mains and services, £2,000 for meters, £1,500 for sub-station equipment, £540 for the wiring of installations, and £2,000 for hire-purchase of domestic apparatus.

Uxbridge.—ELECTRICITY FOR COUNCIL HOUSES.—Electricity is to be installed in 860 Council houses.

Walsall.—EXTENSION.—The supply system is to be extended to the Stella Tileries of Henry Hawkins, Ltd.

BETTER LIGHTING.—The Works Committee is to improve the lighting of the main traffic routes, the estimated capital expenditure being £5,380.

Wallsend.—NEW CABLES.—The North-Eastern Electric Supply Co., Ltd., proposes to lay a cable in Tynemouth Road between an existing sub-station to a new sub-station on the Low Willington Farm estate. Low-voltage cables are to be laid to new streets on the estate.

West Hartlepool.—ELECTRICITY FOR MUNICIPAL HOUSES.—The Town Council has accepted the terms of the North-Eastern Electric Supply Co., Ltd., for supplying electricity to houses in Seaton Lane on a fixed weekly charge basis.

West Riding.—TRAINING COLLEGE INSTALLATION.—The Education Committee is to have electricity installed at the Bingley Training College at an estimated cost of £3,700.

Wick.—BULK SUPPLY.—Although final adjustments have still to be made, the Town Council and the Thurso and District Electric Supply Co., Ltd., have practically completed an agreement for the bulk supply of electricity by the Town Council to the company. The company has obtained an Order empowering it to develop the county of Caithness outside Wick.

Winchester.—COOKER HIRE CHARGES.—The City Council has approved a recommendation of the electrical engineer that the hire charge after the third year for the larger type of electric cookers shall be 7s. 6d. instead of 8s. 6d. a quarter. Special utensils for use on electric cookers are to be supplied on hire-purchase terms.

Yugoslavia.—BIGGEST POWER STATION OPENED.—A *Reuter* message from Belgrade states that Yugoslavia's biggest power station, built by the City of Skoplje, was opened last week by the Prime Minister, M. Stoyadinovitch.

Traction

Blackpool.—TRAMWAY IMPROVEMENTS.—The Transport Committee is to re-lay sections of the tramway track and also construct a central single tram track in Talbot Road to Abingdon Street. Fifteen additional double-deck cars are to be purchased.

Gateshead.—TROLLEY-BUS BILL UNOPPOSED.—The Bill promoted by the Gateshead and District Tramways Co., Ltd., which seeks to authorise the company to convert its tram service to operation by trolley-bus, has been sent to the Unopposed Bills Committee of the House of Commons. A Bill promoted by the Gateshead Corporation to take over the trams and introduce trolley-buses was rejected some months ago. As a result of agreements reached with the company both the Gateshead and Felling Councils have withdrawn their opposition to the company's Bill.

Lancashire.—TRANSPORT CONFERENCE.—The transport conference held in Manchester last week, reference to which was made in our issue of July 8th, was attended by 350 delegates. The conference culminated in a resolution approving the formation of a committee to formulate ways and means of federating the control of transport in the county. At a luncheon at which the Minister of Transport was present, Lord Stamp said that co-ordination seemed a vital necessity, but, even if they had co-ordination within the county, they would still be dependent on transport with the rest of the country and the world. Ald. W. T. Kelly, M.P., expressed surprise at the non-progress of railways in the county, while the South was developing railway electrification, not experimentally, but successfully.

London.—L.P.T.B. BILL.—According to *The Times*, opposition to the London Passenger Board Bill in the House of Lords has been withdrawn and the Bill will appear later before an Unopposed Bills Committee.

Middlesex.—OPENING OF NEW ELECTRIC LINES.—At a recent meeting of the County Council it was announced that the tube extension from Highgate Arehway to East Finchley and the Baker Street to Stanmore scheme, with a new line between Baker Street and Finchley Road, would be opened in June next. Other schemes would be inaugurated as follows: Finchley Central to High Barnet, December, 1939; Northern City line extension and electrification of the Alexandra Palace line, September, 1940; North Acton to Ruislip, September to December, 1940; and Finchley Central to Edgware and Bushey Heath, North Acton to Denham, and widening between Harrow-on-the-Hill and Rickmansworth, December, 1940.

Northern Ireland.—MORE TROLLEY-BUSES IN BELFAST?—The *Passenger Transport Journal* understands that the experimental trolley-bus route which has been operating in Belfast for the past three months has given great satisfaction, and it is anticipated that by next autumn it will be possible to make a decision as to the desirability of extending the services.

South Africa.—PROGRESS OF ELECTRIFICATION.—Last year the Electricity Supply Commission sold direct 236 million kWh for traction purposes, as compared with 188 million kWh in 1936, an increase of 26 per cent. During the year the Glencoe-Volksrust section of the Natal main line was completed, and railway traffic is now being operated electrically over the 326½ route miles from Port Natal to the Transvaal border. Work was commenced on the conversion of the Durban Bluff line from Booth to Wests (7 route miles), and it is expected that electric trains will soon be running over this section. The South African Railways and Harbours Administration has also decided to electrify the suburban railway line from Rossburgh to Hillcrest (24 route miles). In the Transvaal, the Reef railway electrification scheme from Randfontein to Springs has been completed, and it is expected that the Germiston-Pretoria section will be operated electrically by the end of the present month. Electrification of the Pinelands-Langa section of the Cape suburban railways (2½ route miles) is in hand.

Communications

Argentina.—NEW TRANSMITTER AT BUENOS AIRES.—Since 1927 the Colon Theatre, Buenos Aires, has regularly broadcast its opera and other musical activities over a 5-kW transmitter. A little over a year ago the municipality ordered from the Compania Standard Electrica Argentina, an associate of Standard Telephones & Cables, Ltd., a new 50-kW transmitter which was inaugurated by the President of the Republic at the opening of the present opera season. The transmitter uses the new high-efficiency Doherty amplifier developed by the Bell Laboratories. Power is fed to the aerial through a concentric copper-tube transmission line 640 ft. in length, filled with nitrogen gas. The aerial is a shunt-excited earthed vertical radiator 778 ft. high, and is said to be the highest of its type in the world. The Colon transmitter has the distinction of being the only medium wave station in the world whose primary purpose is to broadcast opera.

Great Britain.—NEW LINER'S RADIO EQUIPMENT.—The largest liner ever built in an English shipyard, the new Cunard White Star *Mauretania*, will be equipped with comprehensive and

specially designed Marconi radio equipment to enable the following services to be carried out: Reception of press messages, long-wave telegraphy, medium-wave telegraphy, short-wave telegraphy, short-wave commercial telephony, continuous distress watch, direction finding, and emergency transmission on 600 metres. In connection with these services three separate transmitters will be employed, one for each of the short-, medium- and long-wave channels. The medium- and long-wave transmitters will be suitable for telegraphy only, and will have eight spot waves on each transmitter. The short-wave transmitter will be suitable for both telegraphy and telephony, and will have eighteen spot waves. Other apparatus includes the latest pattern direction finder, of the Bellini-Tosi type, with fixed aerial and rotating goniometer, the distress alarm installation, consisting of equipment which will maintain a continuous automatic 600 metres watch, together with a standard spark emergency transmitter, tuned to 600 metres, and complete radio equipment and searchlights in the two port and starboard motor launches. Power for the transmitters and receivers will be provided by three dynamos, and the total power used for carrying out all the services concurrently will be less than 30 h.p. Sound reproducing equipment will provide entertainment in all parts of the ship from radio, gramophone or microphone sources. A specially designed receiver is incorporated in order to receive broadcast programmes which can be distributed to any of the numerous loudspeakers which will be installed in the public rooms in all parts of the ship. The "Echometer" sounding device which is being fitted will have a visual indicator and an automatic recorder. The latter, in addition to providing depth indication, will automatically plot a graph of the contours of the sea bed.

Germany.—"VISUAL TELEPHONE" EXTENSION.—On Tuesday the "visual telephone" system between Berlin, Leipzig and Nuremberg was extended to Munich. The system enables persons who are telephoning to see each other on a small conveniently placed screen.

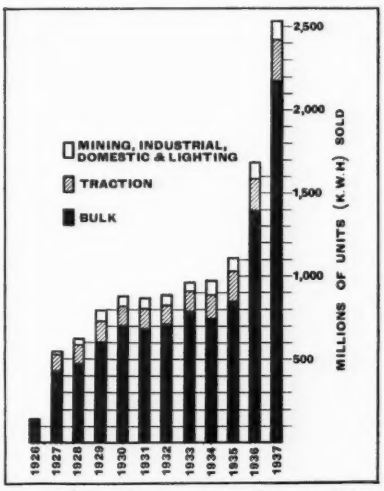
Eventful Year in South Africa

Commission's record output under difficulties

SO vigorously has the demand for electricity in South Africa grown since the end of the economic depression in 1933 that it has been necessary for the Electricity Supply Commission to carry out an almost continuous programme of extensions to its power stations. At the end of last year the aggregate capacity, excluding house sets, was 517,543 kW, and a further 228,500 kW of plant was in course of installation or on order (30,000 kW at Congella, 198,000 kW at Klip and 500 kW at Volksrust). Notwithstanding the fact that the Klip station, which will eventually have an installed capacity of 424,000 kW, is only half completed, proposals for the construction of another large power station to meet the anticipated power requirements of the expanding gold mining industry are under consideration. The first turbo-alternator at the Capetown Corporation's new Table Bay station, which will be interconnected with the Commission's Salt River station under the pooling agreement, is expected to be brought into service next month.

	(1)	(2)	(3)	(4)	(5)	(6)
Colenso	238.3	171,773	1.53	12,320	18.1	10s. 10d.
Congella	199.6	133,098	1.41	12,540	19.3	15s. 2d.
Klip.....	1,445.5	1,098,196	1.63	9,640	21.7	3s. 0d.
Salt River.....	321.5	204,179	1.34	12,630	20.2	24s. 8d.
Witbank	720.9	655,818	1.94	11,120	15.8	2s. 2d.

(1) KWh generated (millions). (2) Coal consumed in tons of 2,000 lb. (3) lb. of coal consumed per kWh sent out. (4) Average B.th.u. per lb. (5) Thermal efficiency on kWh sent out, per cent. (6) Average cost per ton of coal.



In two years the sales of energy have more than doubled. Last year the total was 2,535.6 million kWh, an increase of 50 per cent. over 1936. While the flourishing gold mining industry accounted for most of this, substantial increases were recorded throughout the Commission's undertakings for all classes of consumers. Thus, in direct supplies the domestic and street lighting consumption rose by 36 per cent to 8.3 million kWh, while a large proportion of the energy sold in bulk to municipalities (228.2 million kWh; 10 per cent. increase) was for domestic and lighting purposes. Traction supplies rose by nearly 26 per cent. to 236.0 million kWh, chiefly as the result of further railway electrification; when the present programme is finished there will be 1,110 track miles of electrified lines.

The accompanying table summarises the operating conditions of the Commission's steam stations. The average price per kWh sold was 0.180d. (0.217d. in 1936), but including sundry revenue the average worked out at 0.183. The cost per kWh sold was 0.181d. (0.219d.). The total cost of coal consumed amounted to £682,164, including rail charges of £322,592, and the average cost of fuel per kWh sold was 0.065d. (0.066d. in the previous year). The total revenue was £1,930,719, an increase of nearly 25 per cent., and there was a surplus on the year of £20,801.

The large increase in demand on the Commission's undertakings was met in spite of interruptions to the supply caused by the worst weather conditions that it has ever experienced at Durban and Capetown, and by various mishaps to the generating plant. At the Salt River station, which had a record output of 305.6 million kWh, a breakdown of one of the 20,000-kW sets was followed the next day by trouble with the circulating water system, which was blocked by unusually large quantities of sand and seaweed during a storm of exceptional severity. Part of the screening plant was put out of action and quantities of debris were drawn up into the condensers, necessitating the easing of the load and frequent changing over of the turbo-generators during cleaning operations. A scheme is now in hand for bringing the circulating water from the new harbour basin. In November a further mishap put another 20,000-kW machine out of service for three months while the set which had previously broken down was still operating at half its normal capacity. Another violent storm caused extensive flood damage at the Congella station, resulting in the complete cessation of the supply for ten hours. In two hours more than 11 in. of rain fell in the vicinity. At Colenso the shortage of coal supplies was so critical that on several occasions the stock was barely sufficient for one day.

The Colenso power station of the South African Electricity Supply Commission

An annexure to the report gives statistics for the whole of the Union extracted from the 1935-36 industrial census. In this 13 undertakings are included in the "under 2 lb. per kWh generated" class, 72 had fuel consumptions of between 2 lb. and 8 lb. per kWh and 36 exceeded 8 lb.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aldershot.—August 2nd. Borough Council. Wiring of the laundry block in course of erection at the Isolation Hospital, Cemetery Road. (See this issue.)

Argentina.—BUENOS AIRES.—July 20th. National Sanitation Works Department. One electric generating set. (T.Y. 23358/38.)*

Australia.—SYDNEY.—September 28th. Department of Railways (Electrical Branch). Turbo-alternator, surface condenser, feed water heaters, &c., for Ultimo power station. (T. 23984/38.)*
September 1st. County Council. 120/11,000-V metal-clad oil circuit-breaker switching equipments. (T. 23987/38.)*
MELBOURNE.—August 8th. City Council. Three-phase transformers. (T.Y. 24257/38.)*
BRISBANE.—September 20th. City Electric Light Co. 44-kV and 11-kV switchgear. (T. 24209/38.)*

Beckenham.—July 19th. Electricity Undertaking. P.i., lead covered, steel wire armoured cable and joints, pilot cable and cable covers and tiles. (July 8th.)

Belfast.—July 29th. Electricity Department. Steel fire-resisting partition, portable loading elevator, and replating storage battery cells at Harbour power station. 33-kV indoor and outdoor switchgear and interconnecting cables, 33-kV underground cables and pilot and telephone cables. (July 8th.)

Berwickshire.—July 18th. County Council. Electrical installation at new central school, Chirnside. R. Wood, director of education, County Offices, Duns.

Birmingham.—July 25th. Electric Supply Department. Domestic electrical apparatus for twelve months. (July 1st.)
August 11th. Electric cooker control units for twelve months. (See this issue.)

Blackpool.—July 25th. Borough Council. Stores and materials, including electrical sundries. (July 8th.)

Burnley.—July 29th. Borough Council. Installation of electrical wiring at Towneley Senior Boys' School. (See this issue.)

Bury.—July 18th. Electricity Department. P.i. lead-covered cables for twelve months. (July 8th.)

Christchurch.—September 6th. Municipal Electricity Department. 11-kV sub-station switchgear and supervisory control equipment. (T.Y. 24293/38.)*

Darlington.—Town Council. Installation of electricity in eight-six houses.

Dublin.—September 23rd. Commissioners of Public Works in Ireland. Field lighting equipment for the Dublin Airport, Collinstown. (See this issue.)
August 26th. Electricity Supply Board. Circuit-breakers, isolating switches and compressed air operating equipments and instrument transformers. (See this issue.)

East Ham.—August 13th. Borough Council. Electrical installation in connection with the alterations and additions to the Hart Sanatorium, Woodford Green, Essex. (July 8th.)

Egypt.—CAIRO.—August 3rd. Ministry of Public Health. Electrical equipment for the electrical installation extension at Fayoum. (T. 23674/38.)*

Felixstowe.—July 22nd. Electricity Department. Four metal-clad, 11,000-V switchgear units. (July 1st.)

Finchley.—July 25th. Electricity Department. Immersion heaters and circulators and cooking utensils for twelve months: wrought iron brackets for street lighting fittings and control equipment for mercury discharge lighting. (July 1st.)

Gainsborough.—August 13th. U.D.C. 6.6-kV metal-clad switchgear. (See this issue.)

Hull.—Telephone Committee. Lead covered telephone cables. (See this issue.)

India.—SIMLA.—July 30th. Indian Stores Department. Insulating materials. (T. 23759/38.)*
August 6th. Electric lamps for twelve months. (T. 24233/1938.)*

Jarrow-on-Tyne.—Town Council. Electrical installations in 300 houses. J. S. Weir, borough engineer, Town Hall.

Leeds.—July 16th. Health Committee. Electrical work at the City Hospital, Seacroft. Town Clerk's Office, Room 57, Civic Hall.
July 18th. Corporation. Electrical installation at the new pathological and mortuary block at St. James's Hospital. Town Clerk (deposit £2 2s.).
July 21st. Libraries and Arts Committee. Electric lighting installation at Temple Newsam Mansion. Town Clerk.

Lewes.—July 16th. Borough Council. Two electrically driven pumps, complete with motors, switchgear, and venturi meters. Town Clerk, Town Hall.

London.—July 21st. H.M. Office of Works. Electrical accessories. (July 8th.)
ISLINGTON.—August 10th. Borough Council. Electric wires, conduits and other accessories. (July 8th.)
August 24th. Metropolitan Water Board. Pumping plant, &c., at the Hampton pumping station, Middlesex. (See this issue.)

Morley.—July 21st. Housing Committee. Electrical work at sixty houses and eight flats on the Wide Lane estate. Town Clerk, Town Hall (deposit £2 2s.).

Newcastle-under-Lyme.—July 27th. Electricity Department. Two mercury arc rectifier equipments and one l.v. and three e.h.v. switch cubicles. (See this issue.)

New Zealand.—WELLINGTON.—September 28th. Posts and Telegraph Department. Seventy-five secondary cells. (T.Y. 24226/38.)*
September 29th. Porcelain or composition insulators and caps. (T. 24227/1938.)*
October 3rd. 1,000 trembler buzzers. (T.Y. 24294/1938.)*
November 1st. 50-kV outdoor steelwork and switchgear. (T.Y. 24300/1938.)*

September 27th. 5,500 condensers. (T.Y. 24225/38.)*
September 29th. 5,000 telephone coils. (24228/38.)*
August 30th. Public Works Department. Four 11-kV switches. (T.24288/1938.)*

OTAGO.—November 30th. Harbour Board. One or two five-ton electric wharf cranes. (T.24292/1938.)*

Portsmouth.—July 19th. Electricity Undertaking. One 37,500 kVA three-phase transformer. (July 1st.)

South Africa.—PRETORIA.—July 21st. Public Works Department. One 75-kVA transformer, one h.v. switch and 1,000 ft. of cable. (T.Y. 23459/38.)*
CAPE TOWN.—July 20th. Electricity Undertaking. 3,500 yd. each of e.h.v. and pilot cable. (T.Y. 23649/1938.)*
July 20th. Electricity Supply Commission. Pin type and suspension strain insulators. (T. 23650/38.)* Electric light poles and fittings. (T. 23642/38.)*
PIETERSBURG.—August 8th. Municipality. Electric motor-driven pumps. (T. 23601/38.)*
JOHANNESBURG.—July 23rd. City Council. Twenty-five miles of cadmium copper trolley wire. (T. 23947/38.)*
July 20th. Electricity meters. (T. 24115/38.)*

Southampton.—August 16th. Electricity Department. Conversion of lifts from d.c. to a.c. supply. (See this issue.)

Stockport.—July 18th. Electricity Department. Sluice valves, and the electrical operation of these and other valves. (July 8th.)

Stoke-on-Trent.—July 19th. Corporation. Electrical installation at Bucknall Infectious Diseases Hospital. Town Clerk, Town Hall (deposit £2).

Uruguay.—MONTEVIDEO.—August 2nd. Electricity Supply and Telephones Administration. 11,700 electric light switches and 5,950 separate covers. (T.Y. 23732/38.)*
July 21st. 32-V, 110-V, 225-V and 230-V metal filament lamps. (T.Y. 23556/38.)*
August 3rd. 30,900 metres of lead-covered conductors. (T.Y. 24170/38.)*
August 9th. 58,000 metres of h.v. and l.v. underground armoured cables. (T.Y. 24262/38.)*

Walthamstow.—July 23rd. Borough Council. Hydraulic and other machinery and piping and electrical equipment in connection therewith at the Concrete Flag Works, Low Hall Farm, Town Clerk (deposit £2 2s.).

Warwick.—July 29th. County Council. Heating and electrical work for the Council. (See this issue.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Barrow-in-Furness.—Electricity Committee. Accepted. L.v. distribution board (£129).—W. Lucy & Co. Two 300-kVA and three 500-kVA transformers (£1,332).—British Electric Transformer Co.

Birkenhead.—Electricity Committee. Accepted. Switch units and control panels (£1,810).—Met.-Vick. Elecl. Co. Wiring installations in twenty houses (£87).—Park Electric Co.

Blackburn.—Town Council. Accepted. 8,000 yd. of 0.10 sq. in. and 1,000 yd. of 0.05 sq. in. bare copper strand.—Whitecross Co.

Blackpool.—Housing Committee. Accepted. Electrical installation at forty-six houses on the Bispham estate.—Laurence Lee.

Boston.—Education Committee. Accepted. Installation of electricity in Carlton Road Junior school (£53).—C. F. Parkinson.

Cheltenham.—Electricity Committee. Accepted. H.v. cables.—Hackbridge Cable Co. L.v. cables.—Aberdare Cables.

East Ham.—Electricity Committee. Accepted. Rectifier (£530).—Hewittic Electric Co. Meters for twelve months.—British Sangamo Co.; Ferranti; Smith Meters.

Eccles.—Electricity Committee. Accepted. Meters for twelve months.—Met.-Vick. Electl. Co.; British Electric Meters.

Hastings.—Electricity Committee. Accepted. Switchgear (£325).—W. Lucy & Co.

Hull.—Telephones Committee. Accepted. Insulators (£261).—Bullers. Cadmium copper wire (£381).—F. Smith & Co.

Leeds.—Gas Committee. Accepted. Emergency electricity generating plant at gasworks (£3,446).—Ashworth & Parker.
Electricity Committee. Accepted. Cables.—Enfield Cable Works (£2,132); Edison Swan Cables (£306); Henley's (£213); Hackbridge Cable Co. (£881); Telegraph Construction & Maintenance Co. (£625); Connollys (Blackley) (£464).
Health Committee. Accepted. Electric truck and charging equipment (£203).—Greenwood & Batley.

Liverpool.—Electric Power and Lighting Committee. Recommended. Transformers and switchgear for the equipment of sub-stations:—Marsh Lane: One 33,000-V panel (£2,039) and one neutral earth switch (£120).—Ferguson, Pailin. One 11,000-

V panel (£1,282).—Switchgear & Cowans. Two 8,000-kVA transformers (£5,022) and one 10,000-kVA transformer (£4,531).—Yorkshire Electric Transformer Co. Smithdown Road: One 22,000-V panel (£1,533) and one neutral earth switch (£101).—Ferguson, Pailin. One 11,000-V panel (£764).—Switchgear and Cowans. One 4,000-kVA transformer (£1,995).—Yorkshire Electric Transformer Co. Lodge Lane: Two 11,000-V panels (£1,513).—English Electric Co. One seven-panel, 22,000-V switchboard (£10,342) and two neutral earth switches (£197).—Ferguson, Pailin. Waterloo: Two 8,000-kVA transformers (£6,956).—Yorkshire Electric Transformer Co.

London.—L.C.C.—Accepted. Electrical installation at Ancona Road school (Woolwich) (£964).—Gladwell & Cook.

L.C.C.—Wiring and fittings for electric lighting, &c., in part block of dwellings on the Bostock Street site, Stepney:

	£		£
Holliday and Son (Electrical). Accepted	**404**	Henfrey (Electrical)	494
Houchin	429	E. W. Merredew	503
W. H. Gaze and Sons	444	Springvale Electrical Co.	504
Buchanan and Curwen	445	J. H. Golding	510
Blackburn, Starling and Co.	448	City Electrical Co.	537
		Anderson, Angell and Co.	569

Supply and erection of electrically driven scrapers for precipitation channels at the Southern Outfall Works:

	£		£
Bagshawe and Co. Accepted	**5,584**	Whitehead and Poole	8,370
Do. do. (alternative)	5,504	Tangyes	8,490
S. S. Stott	6,130	Spencer (Melksham)	8,815
R. Dempster and Sons	6,500	Fraser and Chalmers Engng. Works	9,070
Hartleys (Stoke-on-Trent)	7,500	F. W. Brackett and Co.	9,500
G. Waller and Son	7,980	Ames Crosta Mills and Co.	9,760
W. E. Farrer	8,080		
Clayton, Goodfellow and Co.	8,350		

Provision and erection of an electric passenger-lift in the new nurses' home at New End Hospital, Hampstead:

	£		£
Etchells, Congdon and Muir. Accepted	**1,063**	Bennie Lifts	1,165
Gimson and Co. (Leicester)	1,070	Marryat and Scott	1,257
Glasgow Engineers	1,079	Express Lift Co.	1,367
Pickerings	1,085	J. and E. Hall	1,400
Evans Lifts	1,110	Waygood-Otis	1,467
		Wm. Wadsworth and Sons	1,601

Electrical installation in the nurses' homes, &c., at New End Hospital, Hampstead:

	£		£
Troughton and Young. Accepted	**1,150**	Electrical Installations	1,795
A. J. Hewens and Sons	1,497	Atozed (London)	1,855
Francis Polden and Co.	1,573	Gillham and Jones	1,865
Colston Electrical Co.	1,589	Davis Myer and Co.	2,100
Carr Brothers	1,612	Malcolm and Allan (London)	2,100
G. E. Taylor and Co.	1,678		

Wiring and fittings for the installation of electric lighting, clocks, &c., in four wards at the Archway Hospital, Highgate:

	£		£
Samuel Reed and Sons. Accepted	**892**	Davis Myer and Co.	1,160
Pinching and Walton	946	A. J. Hewens and Sons	1,198
Springvale Electrical Co.	1,046	W. J. Furse and Co. (London)	1,229
Pemberton and Sturgess (Great Britain)	1,049	Collins Electrical	1,244
H. J. Cash and Co.	1,068	Francis Polden and Co.	1,246
Duncan Watson (Electrical Engineers)	1,154	F. H. Wheeler and Co.	1,298
		Buchanan and Curwen	1,360

Wiring and fittings for electric lighting and power systems in block C and the laundry, &c., at New End Hospital, Hampstead:

	£		£
Troughton and Young. Accepted	**479**	G. E. Taylor and Co.	537
Carr Brothers	508	Colston Electrical Co.	537
Davis Myer and Co.	525	Evans and Shea	583
Atozed (London)	531	B. French	612
Electrical Installations	535	Gillham and Jones	632

Electrical fittings at Merton Road School:

	£		£
Holliday and Son (Electrical). Accepted	**915**	Keeble	992
G. Hopkins and Sons	921	E. C. Sparkes and Co.	1,003
Carr Brothers	944	G. E. Taylor and Co.	1,055
Warren Smith and Co.	969	A. Dean and Co.	1,055

Wiring and fittings for electric lighting, supplementary heating and power at Glengall School:

	£		£
Colston Electrical Company. Accepted	**883**	Read and Partners	1,007
Houchin	900	Service Electric Co.	1,011
Pinching and Walton	946	Berkeley Electrical Engineering Co.	1,019
E. and C. Champion	960	G. Hopkins and Sons	1,035
Holliday and Son (Electrical)	975	Warren Smith and Co.	1,043
Jones and Jennings	1,002	F. Troy and Co.	1,058

Wiring and fittings for electric lighting, &c., at Bermondsey Central (Boys) School:

	£		£
Troughton and Young. Accepted	**996**	A. J. Hewens and Sons	1,248
Francis Polden and Co.	1,037	A. Mekhonik	1,310
Pemberton and Sturgess (Great Britain)	1,120	City Electrical Co.	1,344
E. and C. Champion	1,129	Electrical Installations	1,356
		F. H. Wheeler & Co.	1,491

Newark-on-Trent.—Electricity Committee. Accepted. Two feeder pillars (£70).—B.I. Cables. Additional panel for the h.v. switchboard (£190).—Ferguson, Pailin.

Oldbury.—Education Committee. Accepted. Electrical installation at Titford Road school (£218).—S.W. & S. Elec. Power Co.

Portsmouth.—Electricity Committee. Recommended. Four 750-kW transformers (£377 each).—British Electric Transformer Co. Cables.—Aberdare Cables; General Cable Mfg. Co.; Wm. Geipel; Enfield Cable Works.

Shipley.—Electricity Committee. Accepted. One 750-kW traction rectifier (£2,910).—Hewittic Electric Co.

St. Andrews.—Town Council. Accepted. Electrical work at eighty-four houses at Lamond Drive (£652).—R. Bell.

Stockton-on-Tees.—Town Council. Accepted. Equipment for the Yarm Lane sub-station (£900).—A. Reyrolle & Co.

Tunbridge Wells.—Town Council. Accepted. Electrical installation in the new police court and station (£986).—Electric Installations.

Workington.—Electricity Committee. Recommended. One 400-kVA transformer.—Yorkshire Elec. Transformer Co.

Notes

Engineering Summer School

Over eighty teachers in technical colleges and schools assembled at the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd., this week for the annual Summer School arranged by the Board of Education. Speaking at a dinner on Monday in connection with the course, the Parliamentary Secretary to the Board of Education (Mr. Kenneth Lindsay) paid a tribute to the Met.-Vick. Co. for its activities in technical education and Mr. E. G. Savage, senior chief inspector to the Board, scouted the opinion sometimes expressed that apprenticeship "isn't what it was." Sir Felix Pole, in the course of his reply, laid stress on the value of training young men from the Dominions in this country so that they could return home as "Empire missionaries."

Mica as an Insulator

A virtue of the silicate of alumina known as mica is that its good insulating properties do not deteriorate at temperatures of 100 deg. C. or more which are sometimes reached at hot spots in machines running on overload. This quality is shared by micanite, flexible fine splittings of mica bonded together with adhesive insulating material such as shellac. A new publication of Lancashire Dynamo & Crypto, Ltd., compares the heat-resisting properties of micanite with those of other materials in relation to insulation and discusses the method of treating windings thus insulated with vacuum impregnation, pressure-varnishing and enamel-sealing. The average breakdown voltage of mica 0.01 in. thick, is given as 50,000 for both 30 and 100 deg. C. For 0.062 in. mica products the figures are 29,300 and 31,000. This is the only case in which an increase is recorded, average values of 27,800 and 16,200 being given for varnished cloth, for instance.

A.S.E.E. Members Visit Waterworks

By permission of Mr. J. R. Davidson, chief engineer of the Metropolitan Water Board, a large number of members of the Association of Supervising Electrical Engineers and their friends visited the Board's works at Hampton, Middlesex, on Saturday last. The party was divided into three groups and the tour of inspection included the Southwark and Vauxhall, Riverdale, Morelands, Carslake and Main Junction pumping stations, the new generating and pumping station now in course of erection. At the conclusion of the tour thanks were expressed to the Board and to Messrs. C. J. Alexander, H. F. Mitchell and M. MacKenzie, who acted as guides.

The Paris High Tension Conference

The British National Committee of the Paris High-Tension Conference (the Conference Internationale des Grand Reseaux Electriques) is seeking to secure that British developments and practice are adequately represented by papers submitted to the 1939 sessions. All papers must be submitted through the National Committees, and as the number of papers is limited, intending authors should notify the Secretary, C.I.G.R.E., British National Committee, 15, Savoy Street, W.C.2, by September 15th, of the subjects of proposed papers, followed by a summary not exceeding, say, 300 words. Approved papers must be submitted to Paris by December 31st, and should be in the hands of the secretary of the British Committee by the middle of November.

Sir George Lee chatting to Dr. and Mrs. A. H. Railing at the ball given by the G.E.C. to members attending the I.E.E. Summer Meeting (See p. 81)

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

FUSETON fuses.

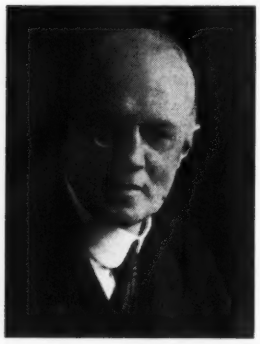
RADIOFIX aerials.

Shallow metal switch boxes suitable for up to four standard flush switches but measuring externally only 2¾ in. wide.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

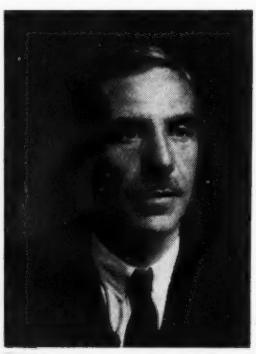
At a recent meeting of the Council of the Institute of Fuel it was decided to award the Melchett Medal for the current year to **Professor R. V. Wheeler,** D.Sc., F.G.S., F.I.C. Professor Wheeler will give the Melchett Lecture before the Institute on October 13th, at the Institution of Mechanical Engineers, Storey's Gate, S.W.1. Professor Wheeler has been well known for many years as the Professor of Fuel Technology in the University of Sheffield, and also as the Director of the Safety in Mines Research Board Experimental Stations in Sheffield and Buxton. Born in 1883, he was educated at Plymouth College, Plymouth, and Owens College, Manchester. He is a Dalton Scholar and Fellow of the University of Manchester. He is the author or joint author of 189 publications dealing with the constitution of coal, blast furnace coke, coal mining problems, scientific and technical papers on coal combustion and flame, besides being joint editor of *Fuel in Science and Practice*. Professor Wheeler has acted for many years as scientific advisor to British Government departments as well as many industrial organisations.



[Elliott & Fry
Prof. R. V. Wheeler

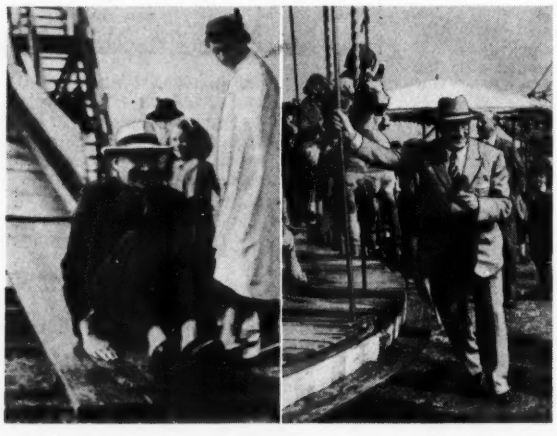
Sir James Devonshire, K.B.E., and **Mr. C. J. Spencer,** directors of the North Metropolitan Electric Power Supply Co., have been elected directors of the Hendon Electric Supply Co., Ltd. Sir James Devonshire has been elected chairman, and **Mr. K. A. Scott Moncrieff** deputy chairman of the Hendon company.

Mr. G. Hurford, who has been appointed assistant manufacturing supervisor of the International Telephone and Telegraph Corporation, received his technical education in telegraphy and telephony at the City and Guilds. He was appointed assistant chief engineer to the Bell Telephone Manufacturing Co., Antwerp, in 1919, and two years later became European chief to the International Western Electric Co., London. In 1925 he was appointed technical superintendent to Standard Telephones and Cables, Ltd., and in 1928 became director of manufacture, which position he held until 1933, when he was appointed managing director of Kolster-Brandes, Ltd. He left that company in 1935 to take up the position of assistant to the general technical director of the International Standard Electric Corporation. He is a member of the I.E.E., and is a founder member of the Works Management Association, of which he was first chairman of the Council.



[Elliott & Fry
Mr. G. Hurford

The Times reports that the Colonial Office has announced the following promotions: **Mr. J. O. Hall,** electrical engineer, to be senior electrical engineer, Public Works Department, Nigeria. **Mr. C. Harry,** assistant electrical engineer, to be senior executive electrical engineer, Malayan Public Works Service. **Mr. E. F. Stephenson,** assistant electrical engineer, Malayan Public Works Service, to be senior electrical engineer, Selangor, F.M.S.



Happy snaps at the recent Henley sports: Left: Sir Edward Crowe helter skelters. Right: Sir Montague Hughman (chairman) assists with a roundabout

The scrutineers appointed at the ordinary meeting of the I.E.E., held on April 28th, have reported to the President that the result of the ballot to fill the vacancies which will occur in the Council on September 30th is as follows:—President: **Dr. A. P. M. Fleming,** C.B.E., M.Sc.; Vice-President: **Prof. C. L. Fortescue,** O.B.E., M.A.; Hon. Treasurer: **Mr. W. McClelland,** C.B., O.B.E.; ordinary members of Council: **Dr. P. Dunsheath,** O.B.E., M.A., **Prof. R. O. Kapp,** B.Sc., **Mr. A. P. Young,** O.B.E., and **Dr. L. G. Brazier,** B.Sc.

Mr. A. J. Gill, B.Sc., M.I.E.E., M.Inst.R.E., has been appointed Assistant Engineer-in-Chief of the G.P.O. in succession to Mr. B. O. Anson, whose retirement was recorded in our last issue. Mr. Gill gained early engineering experience in Yarrow Shipbuilding Yard and at the British Thomson - Houston Works, Rugby. He entered the P.O. Engineering Department as assistant engineer in 1913, and was attached to the Radio Section. In 1925 he was appointed executive engineer in charge of the radio experimental section at Dollis Hill, becoming assistant staff engineer in 1929, and three years later he succeeded Col. A. S. Angwin as staff engineer of the Radio Branch. Mr. Gill has made several valuable contributions to scientific journals, and has been elected chairman of the Wireless Section of the I.E.E. for the forthcoming session. He has served on many committees, including the C.C.I.R., C.C.I.F., and that of the Department of Scientific and Industrial Research.

[Lafayette
Mr. A. J. Gill

Mr. H. Macartney, formerly of British National Electrics, Ltd., has joined the sales staff of the Jackson Electric Stove Co., Ltd., and will be attached to the Leeds branch.

Mr. W. Loat, Midlands representative of the Midland Electric Manufacturing Co., Ltd., has been appointed to take charge of the company's sales promotion section. He is well known locally, having represented the M.E.M. in this area for the past twenty years. His new activities will bring him into touch with the company's many connections throughout the country.

Mr. W. Loat

Mr. H. V. Painton, manager for India and Burma of Asea Electric, Ltd., is arriving in London in the near future for a short holiday, and his address in England will be c/o Asea Electric, Ltd., Fulbourne Road, Walthamstow, E.17.

Mr. A. C. Crossley, M.P., and **Mr. H. D. Carter** have joined the board of Crossley Brothers, Ltd.

Mr. W. F. Higgs, governing director of Higgs Motors, Ltd., and Mrs. Higgs, are sailing on the *Almeda Star* on July 23rd for South America on a business trip, and will be away about three months.

Obituary

Sir John Snell.—A memorial service to the late Sir John Snell was held at St. Margaret's, Westminster, on Tuesday last. It was attended by a very large number of prominent representatives of all branches of the electrical industry. In our notes on Sir John's career last week we omitted to mention that he was president of the I.M.E.A. in 1902-1903, and that he was awarded the Faraday Medal early this year.

Monsieur P. Rieunier.—The death is reported from Paris at the age of sixty-five of M. Paul Rieunier, for many years chief engineer of the Société de l'Union d'Electricité.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares.

New Companies Registered

Utility Lamp & Fittings Co., Ltd.—Private company. Registered July 2nd. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in electrical and gas appliances and equipment, radio and television apparatus, &c. The directors are: E. A. Siderman, 55, Romney Court, Shepherd's Bush, W.12; and R. R. Bergmann, 22, Lymington Road, N.W.6. Registered office: 41, Gray's Inn Road, W.C.1.

Wireless Without Worry, Ltd.—Private company. Registered July 1st. Capital, £5,000. Objects: To carry on the business of manufacturers and repairers of and wholesale and retail dealers in radio receiving and transmitting apparatus and instruments, &c. The directors are: T. H. Hutchinson, 9, Ashburn Road, Stockport, and three others. Registered office: 12, Wellington Road, South Stockport.

Weldis, Ltd.—Private company. Registered July 1st. Capital, £400. Objects: To carry on the business of manufacturers and repairers of and dealers in electrical and mechanical apparatus and accessories, in particular of radio sets and valves, gramophones, radio-gramophones, &c. The directors are: R. G. Hall, 19, Osterley Gardens, Thornton Heath; and L. F. Brightwell, 26, Edis Street, Regent's Park, N.W.1. Registered office: Gloucester House, 19, Charing Cross Road, W.C.

Davis Myer & Co., Ltd.—Private company. Registered July 1st. Capital, £5,000. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, &c. The subscribers are: A. E. Lowe, 60, Bourneville Gardens, S.W.4; and I. B. Smith, 22, Fordwych Court, Shoot-up-Hill, N.W. Solicitors: Arbeid & Co., 63/5, Piccadilly, W.1.

Beckenham Electrical Co., Ltd.—Private company. Registered July 2nd. Capital, £500. Objects: To carry on the business of electricians, mechanical engineers, and manufacturers and workers of and dealers in electricity, &c. The directors are: R. Mansell (chairman and governing director), 10, Havelock Road, Croydon; R. F. Mansell, 32, Barnfield Road, Croydon; J. G. Francis, 2, Brook Close, Raynes Park, Surrey; and M. J. Mansell, 10, Havelock Road, Croydon. Registered office: 98, High Street, Beckenham, Kent.

Mackie & Simpson, Ltd.—Private company. Registered in Edinburgh June 25th. Capital, £3,000. Objects: To carry on the business of plumbers and electricians, heating, ventilating, electric, hydraulic and general engineers, &c. The directors are: G. Simpson, Mrs. M. A. Simpson and A. M. Simpson, all of Ballantrae, Oxgangs Road, Edinburgh. Registered office: 3, Polwarth Crescent, Edinburgh, 11.

Archibald McNeil & Co., Ltd.—Private company. Registered in Edinburgh June 27th. Capital, £100. Objects: To carry on the business of agents for electrical engineers, mechanical engineers, heating engineers, manufacturers of welding apparatus, &c. The directors are: A. McNeil and Mrs. S. W. V. McNeil, both of 4, Victoria Circus, Glasgow. Registered office: 45, Hope Street, Glasgow.

Weaver & Co. (Refrigeration), Ltd.—Private company. Registered July 5th. Capital, £3,000. Objects: To carry on the business of dealers in and manufacturers, exporters and importers of refrigerators and refrigeration, cooling and ventilating plant, and electrical and domestic appliances, &c. The first directors are: J. H. Weaver, Furze Cottage, Lythe Hill, Shrewsbury; H. A. Perkins, 41, Wylde Green Road, Wylde Green, Birmingham; and B. W. Payne, Starbel, Bayston Hall, Shrewsbury. Registered office: 7, St. Mary's Street, Shrewsbury.

Jackson's (Redcar), Ltd.—Private company. Registered June 29th. Capital, £2,500. Objects: To carry on the business of electricians, radio and electrical engineers, experts and contractors, manufacturers of and dealers in gramophones and sound reproducing machines, &c. The directors are: J. H. Jackson and Mrs. L. Jackson, both of 10, Cherrington Road, Wellington Hill West, Henleaze, Bristol. Registered office: 105, High Street, Redcar, Yorks.

A. E. Fryer & Co., Ltd.—Private company. Registered July 4th. Capital, £400. Objects: To carry on the business of manufacturers, repairers, hirers and hire-purchase financers of and dealers in electrical and mechanical apparatus, accessories and components, and in particular wireless sets, radio sets and valves, gramophones and television sets, &c. The directors, are: A. E. Fryer, 3, Beaumont Road, Chorlton-cum-Hardy, Manchester; and E. Thomas, 105, Clinton Avenue, Moss Side, Manchester. Registered office: 115, Princess Road, Moss Side, Manchester.

Kingsons', Ltd.—Private company. Registered July 6th. Capital, £1,000. Objects: To carry on the business of electric and radio engineers, &c. The directors are: J. Stukings, 35, Daneby Road, S.E.6; and L. E. Wilson, 5, Penderry Rise, Catford, S.E.6. Solicitor: E. A. Mathew, 113, Newington Causeway, S.E.1.

J. L. Goldsman, Ltd.—Private company. Registered July 8th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in radio apparatus and equipment, electrical and mechanical engineers, &c. The directors are: J. L. Goldsman, 68, Woodlands, Golders Green, N.W.11; and W. R. Bertram, G.M.G., D.S.O., Regent House, Kingsway, W.C.2.

Vacuum-Science Products, Ltd.—Private company. Registered July 9th. Capital, £2,500. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in chemical products and by-products, &c. The directors are: P. J. R. Tapp, 40, Rushnell Road, S.W.17, and three others. Registered office: 166, Weir Road, Balham, S.W.12.

J. E. Snow (Plastics), Ltd.—Private company. Registered July 7th. Capital, £5,000. Objects: To acquire the business of manufacturers of articles from plastic materials carried on by John E. Snow as J. E. Snow & Co. at 72, Arundel Street, Sheffield. The directors are: J. E. Snow and Mrs. D. Snow, both of 5, Hoober Avenue, Eccleshall, Sheffield. Registered office: 72, Arundel Street, Sheffield.

P. Hodges & Co., Ltd.—Private company. Registered July 6th. Capital, £1,000. Objects: To carry on the business of mechanical, automobile, electrical and general engineers, &c. The permanent directors are: P. Hodges, "The Lodge," East Bridgford, Notts; and L. J. Hodges, "Camelok," Woodthorpe Drive, Woodthorpe, Notts. Registered office: Standard Machine Works, The Wells Road, Nottingham.

Efandem (1938), Ltd.—Private company. Registered July 7th. Nominal capital, £10,000. Objects: To acquire the goodwill, trade marks, book debts and trade connections of and the benefit of pending contracts and arrangements entered into by Efandem Co., Ltd. (now in liquidation), and to carry on the business of dealers in and factors or agents for the sale and purchase of batteries, cells, accumulators, electric flashlights and their component parts, &c. The first directors are: M. Goodfellow, Oakdene, Lyonsdown, New Barnet, W. H. Laurenson, The Firs, Kingswood, Albrighton, nr. Wolverhampton, and E. N. Rowbotham, 6, Woodcroft, Winchmore Hill, N.21. Solicitors: Bentleys, Stokes & Lowless, 32, Bishopsgate, E.C.2.

Cables for Collieries

PRESENT-DAY practice in the installation of cables in mines is summarised in the following notes based on material supplied by Callender's Cable & Construction Co., Ltd. For connecting the power station or main sub-station to plant on the surface and pithead the cables are usually paper-insulated with lead-sheath and double-wire armouring, vulcanised-rubber insulated with vulcanised bitumen sheath or compound insulated with compound sheath and double-wire armouring. They are usually run in cleats on walls, slung on a catenary or placed in a culvert; when laid in the ground they should be solid in bitumen, but owing to the presence of steam pipes and the danger of ground firing this method is often inadvisable.

In shafts the choice of cables from one of the three types mentioned depends on the analysis of the water present, and (in upcast shafts) the pit gases. They may be suspended in cleats of seasoned pitch pine, elm or oak, treated with Stockholm tar, bolted to the shaft side by ring bolts fixed to the bontons by wrought-iron straps or seated on girders or channel irons let into the shaft side. Servings and compound (not too soft) on the outside of the cable and the application of bitumastic paint at least every three years will protect the armour from bad water.

Two common ways of installing a cable are (1) to lash it by spun yarn to a rope which is lowered by a reversible winch; and (2) to jack up the drum in a cage and pay out the cable from the bottom of the drum (which has an improvised brake) as the cage is slowly lowered. The second method is preferred if the drum can be got into the cage. Two men prevent slack collecting in the cage; others stand on its top and fix the cable in the cleats.

Cables in main roads inbye for supplying haulages and pumps and extending to the coal face are suspended from props, girders or roof arches and are of the same type as before or of the p.i., v.b.-sheathed and d.w.a. type. High-voltage may be taken to within 300 yd. of the coal face and there stepped-down to medium voltage. Medium-voltage gate cables, usually compound insulated and sheathed and d.w.a. or v.i.r., v.b. sheathed and d.w.a., run from the transformer to a bank of switches at the gate end nearest the coal face. From these are taken the coal-cutter, conveyor and drill trailing cables.

The four-core v.i.r., t.r.s. coal-cutter cables once used extensively on a.c. systems have given way to cables either individually or collectively screened with copper at earth potential with a fifth core as pilot for remote control, conforming to B.S.S. 708. Conveyor cables are similar, except that pliable wire armour is used instead of copper screen. For drills five-core 0.007 or 0.01 sq. in. v.i.r., t.r.s. cables can be used if exemption is obtained from the regulation that calls for the inclusion of an earth conductor of 0.0225 sq. in.

Telephone cables, with safe instruments, may be v.i.r., taped and braided, but with instruments of flameproof pattern only, v.i.r. insulated cores wormed circular with bitumen, s.w.a. and braided should be used. Straight cores may be incorporated for signalling or a similar separate cable may be installed.

Metal Surfacing Co., Ltd.—Private company. Registered July 7th. Capital, £100. Objects: To acquire any patents, licences and like rights relating to electro-plating or the electro-deposition of any metals, and to carry on the business of electroplaters, electrical and mechanical engineers, metal workers, &c. The directors are: L. W. Neilson, address not stated, T. Easton, 22, Fenchurch Street, E.C.3, and four others. Solicitors: Thomas Cooper & Co., 21, Leadenhall Street, E.C.

Berec Battery Co., Ltd.—Private company. Registered July 7th. Capital, £100. Objects: To carry on the business of electricians, electrical engineers, manufacturers of and dealers in electrical appliances, accumulators, batteries, &c. The directors are: F. W. Stevens, 20, Wentworth Park, Church End, Finchley, N., and C. G. White, 54, Chandos Avenue, Whetstone, N.20. Registered office: Bowmans Place, Holloway, N.7.

Returns of Electrical Companies

Dowling Sons, Ltd.—Capital, £150 in 100 preference shares of £1 and 500 ordinary shares of 2s. Return dated June 15th, 1937 (filed March 18th, 1938). 50 preference and 254 ordinary shares taken up. £75 8s. paid. Mortgages and charges, £131 10s.

C. C. Pudney & Co., Ltd.—Capital, £6,000 in £1 shares. Return dated July 14th, 1937 (filed May 17th, 1938). All shares taken up. £3,560 paid. £2,440 considered as paid. Mortgages and charges, £500.

R. Marshall Carr, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1937 (filed June 10th, 1938). 350 shares taken up. £350 paid. Mortgages and charges, nil.

R. King & Sons, Ltd.—Capital, £5,000 in £1 shares. Return dated February 1st, 1937 (filed February 19th, 1938). All shares taken up. £1,200 paid. £3,800 considered as paid. Mortgages and charges, nil.

Leslie Fink, Ltd.—Capital, £1,000 in £1 shares. Return dated December 18th, 1937 (filed May 26th, 1938). All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges, £1,600.

Powerplus (1927), Ltd.—Capital, £20,000 in £1 shares. Return dated December 31st, 1937 (filed May 21st, 1938). 18,550 shares taken up. £11,050 paid. £7,500 considered as paid. Mortgages and charges, £2,750.

J. S. Peress, Ltd.—Satisfaction in full on June 17th, 1938, of second debentures registered February 16th, 1937, securing £2,000.

J. F. Poynter, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated June 24th, 1938, to secure £300. Holders: Atlas Lamps, Ltd., 105, Judd Street, W.C.1.

British Arc Welding Co. (Bristol Channel), Ltd.—Satisfaction in full on June 17th, 1938, of mortgage registered June 18th, 1925. (According to the register of mortgages, the mortgage registered June 18th, 1925, originally secured all moneys due to bank.)

Eastnor Electric Co., Ltd.—The nominal capital has been increased by the addition of £9,500 in £1 ordinary shares beyond the registered capital of £500.

Telephone Rentals, Ltd.—The nominal capital has been increased by the addition of £200,000 beyond the registered capital of £800,000. The additional capital is divided into 800,000 ordinary shares of 5s. each.

A. E. Dees, Ltd.—Debenture charged on the company's property, present and future, including uncalled capital, dated June 11th, 1938, to secure £250. Holder: T. V. Devey, Groat House, Collingwood Street, Newcastle-upon-Tyne.

J. Warsop & Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated June 15th, 1938, to secure £1,000. Holder: E. H. Mackie, "Newlands," Puttenham, Surrey.

Britannic Electric Cable & Construction Co., Ltd.—Debenture charged on Britannic Works, Iver, Bucks, and company's undertaking and other property, present and future, including uncalled and unpaid capital, dated June 28th, 1938, to secure £75,000. Holders: Westminster Bank, Ltd.

Forest City Electric Co., Ltd.—Capital, £5,000 in £1 shares. Return dated February 10th, 1938. All shares taken up. £2,210 paid. £2,790 considered as paid. Mortgages and charges, nil.

Electric Services (Liverpool), Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1937 (filed May 6th, 1938). 152 shares taken up. £152 paid. Mortgages and charges, nil.

Hardman & Co., Ltd.—Capital, £500 in £1 shares. Return dated September 17th, 1937 (filed April 23rd, 1938). 480 shares taken up. £480 paid. Mortgages and charges, nil.

Carwin Electric Co., Ltd.—Capital, £2,000 in £1 shares. Return dated September 9th, 1937 (filed May 18th, 1938). 1,750 shares taken up. £1,750 considered as paid. Mortgages and charges, nil.

Electrified Utilities, Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1937 (filed May 25th, 1938). 299 shares taken up. £299 paid. Mortgages and charges, nil.

Acorn Electrical Co., Ltd.—Capital, £100 in £1 shares. Return dated January 14th (filed April 6th), 1938. All shares taken up. £100 paid. Mortgages and charges, nil.

Yorkshire Switchgear & Engineering Co., Ltd.—Capital, £10,000 in 10,000 shares of £1. Return dated April 4th, 1938. 5,382 shares taken up. £2,382 paid. £3,000 considered as paid. Mortgages and charges, £4,000.

J. Segal, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated June 27th, 1938, to secure £5,000. Holders: Branch Nominees, Ltd.

Strange & Sons Electrical Engineering Co., Ltd.—Capital, £200 in £1 shares. Return dated December 31st, 1937 (filed May 24th, 1938). 116 shares taken up. £1,160 paid (£1 plus £9 per share premium). Mortgages and charges, £500.

B. C. & H. Power Station Co., Ltd.—Particulars have been filed of 3½ per cent. debenture stock to secure £1,650,000, authorrised June 10th, 1938, and covered by trust deed dated June 22nd, 1938, charged on properties in Little Barford and Eaton Socon, Beds, sums due under an agreement dated April 21st, 1938, and the company's undertaking and other property, present and future, including uncalled capital. The whole amount is now issued. Trustees: Prudential Assurance Co., Ltd. (The company takes power to issue further stock.)

John Richards & Co. (Electrical Engineers), Ltd.—Capital, £6,000 in £1 shares. Return dated December 31st, 1937 (filed April 6th, 1938). 4,802 shares taken up. £2 paid. £4,800 considered as paid. Mortgages and charges, nil.

Caledonian Electric Services, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1937 (filed April 21st, 1938). All shares taken up. £1,000 paid. Mortgages and charges, £200.

Albert Electric Co., Ltd.—Capital, £200 in £1 shares. Return dated September 28th, 1937 (filed April 14th, 1938). 50 shares taken up. £50 paid. Mortgages and charges, nil.

Univolt Electric, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1937 (filed May 21st, 1938). All shares taken up. £750 paid. £250 considered as paid. Mortgages and charges, nil.

Acton Battery Co., Ltd.—Capital, £2,100 in 2,000 6 per cent. preference shares of £1 and 2,000 ordinary shares of 1s. Return dated December 31st, 1937 (filed May 26th, 1938). 1,650 preference and 1,600 ordinary shares taken up. £1,400 paid on 1,400 preference shares. £330 considered as paid on 250 preference and 1,600 ordinary shares. Mortgages and charges, £5,000.

Alton District Electricity Co., Ltd.—Capital, £35,000 in £1 shares. Return dated March 24th, 1938. All shares taken up. £35,000 paid. Mortgages and charges, nil.

National Electrical Supplies Co., Ltd.—Capital, £3,000 in 2,000 preference shares of £1 and 10,000 ordinary shares of 2s. Return dated April 13th, 1938. 1,000 preference and 4,100 ordinary shares taken up. £1,410 paid. Mortgages and charges, nil.

T. W. Broadbent, Ltd.—Capital, £5,000 in 440 5 per cent. preference and 560 ordinary shares of £5. Return dated July 8th, 1937 (filed February 12th, 1938). All shares taken up. £35 paid on seven ordinary shares. £4,965 considered as paid on the remainder. Mortgages and charges, nil.

Surrey Cables, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1937 (filed April 1st, 1938). Two shares taken up. £2 paid. Mortgages and charges, nil.

Banbury and District Electric Supply Co., Ltd.—Capital, £75,000 in 7,500 ordinary shares of £10. Return dated April 11th, 1938. All shares taken up. £50,000 paid. £25,000 considered as paid. Mortgages and charges, nil.

John Spencer, Ltd.—Capital, £75,000 in 10,000 preference and 5,000 ordinary shares of £5. Return dated May 17th, 1938. 10,000 preference and 1,027 ordinary shares taken up. £55,135 considered as paid. Mortgages and charges, £60,000.

Abbott & Hawkins, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1937 (filed April 11th, 1938). Two shares taken up. £2 paid. Mortgages and charges, nil.

Morphy-Richards, Ltd.—The nominal capital has been increased by the addition of £3,000 beyond the registered capital of £2,000. The additional capital is divided into 500 "A" and 2,500 7 per cent. redeemable preference shares of £1.

Electromagnets, Ltd.—Capital £5,000 in £1 shares. Return dated April 23rd, 1938. 4,800 shares taken up. £4,800 paid. Mortgages and charges, nil.

Tricity Cookers, Ltd.—Capital, £20,000 in £1 shares. Return dated January 4th, 1938. 19,990 shares taken up. £17,741 paid. £2,249 considered as paid. Mortgages and charges, £10,000.

Amesbury Electric Light & General Supply Co., Ltd.—Capital, £12,000 in £1 shares. Return dated March 24th, 1938. All shares taken up. £12,000 paid. Mortgages and charges, nil.

A. O. Gibbons, Ltd.—Capital, £5,900 in 2,900 preference and 3,000 ordinary shares of £1. Return dated December 30th, 1937 (filed May 31st, 1938). 1,400 preference and 1,500 ordinary shares taken up. £1,901 paid. £999 considered as paid. Mortgages and charges, nil.

British Electro Metallurgical Co., Ltd.—The nominal capital has been increased by the addition of £150,000 beyond the registered capital of £100,000. The additional capital is divided into 150,000 unclassified shares of £1 each. This private company was registered on March 22nd, 1937. Between May 14th and January 19th, 1938, 33,000 shares were allotted for cash, the allottees being Sir Edmund Davis (11,000); Percival Huffman (11,000); Wm. H. Sneath, of New York (5,500), and Ralph C. Brown (5,500). The directors are: Sir Edmund Davis (director of Rhodesia Chrome Mines, Ltd.), P. Huffman, Wm. H. Sneath (president of Electric Furnace Products Co., Ltd.), and R. C. Brown (director of British Acheson Electrodes, Ltd.).

Naider Bros. & Thompson, Ltd.—Satisfaction in full on June 1st, 1938, of two mortgages dated May 8th, 1934, and registered May 22nd, 1934. (According to the register of mortgages, the two mortgages registered May 22nd, 1934, originally secured all moneys due to bank.)

Booth & Bomford, Ltd.—The nominal capital has been increased by the addition of £8,000 in £1 ordinary shares beyond the registered capital of £2,000.

Keswick Electric Light Co., Ltd.—Capital, £20,000 in 5,000 preference and 15,000 ordinary shares of £1. Return dated April 7th, 1938. 4,000 preference and 15,000 ordinary shares taken up. £13,000 paid on 13,000 ordinary shares. £6,000 considered as paid on 4,000 preference and 2,000 ordinary shares. Mortgages and charges, nil.

Northern Electric Wire Co., Ltd.—Capital, £100 in £1 shares. Return dated January 6th, 1938. Three shares taken up. £3 paid. Mortgages and charges, nil.

Electrolines, Ltd.—Capital, £2,500 in 1,000 ordinary and 1,500 preference shares of £1. Return dated December 31st, 1937 (filed May 2nd, 1938). 200 ordinary shares taken up. £200 paid. Mortgages and charges, nil.

City Notes

The Hendon Electric Supply Co., Ltd.—At an extraordinary meeting of the North Metropolitan Electric Power Supply Co. held on June 16th resolutions were passed creating £418,000 new ordinary stock and £200,000 new preference stock of the company for the purpose of an offer being made by the North Metropolitan Co. for the acquisition of the ordinary and preference shares of the Hendon Electric Supply Co., Ltd. The offer was conditional upon acceptance not later than July 4th, 1938, although a reasonable extension may be allowed to Hendon Co. shareholders absent or abroad. The offer has been accepted to date by the holders of over 90 per cent. of both ordinary and preference shares.

The Victoria Falls and Transvaal Power Co., Ltd., reports a total revenue for 1937 of £1,502,906, as compared with £1,360,924 in the preceding year, to which is added interest, &c., of £121,891, making £1,624,797. After providing for depreciation, amounts written off, and provision for income-tax and renewals fund, there is a net profit of £612,628 (against £586,365), to which is added £135,831 brought in, making £748,460. The final ordinary dividend is 9½ per cent., making 13½ per cent. for the year (against 12 per cent.), reserve receives £100,000, and £197,535 is carried forward. The report states that the sales during the year showed a satisfactory increase over those of the previous year and the sales for the first six months of the current year show a further increase over those for the corresponding period of 1937. The outstanding demands for additional supplies exceed those at the beginning of the year under review. The work on the Klip power station has proceeded without interruption, and at the end of the year the six sets for which the station was originally designed were in commission. In view of the increase of demand and the notified demands to be provided for, it was decided to extend this station to double its original capacity, and the first of the additional six sets is now in commission. This station, which is owned by the Electricity Supply Commission of South Africa, is by agreement with the Commission being erected and operated by the company, which will take the entire output. It is anticipated that the demands to be met in future will exceed the capacity of the Klip power station when completed, and arrangements are therefore being made with the Electricity Supply Commission for the erection of a further power station. Meeting: July 26th.

Christy Bros. & Co., Ltd.—Presiding at the annual meeting on July 12th Mr. F. Christy said that during the past year they had carried out a large number of contracts in all departments, with the result that practically every item in the accounts showed a satisfactory increase. All the electricity supply undertakings operating under their management had again shown very substantial growth. The North Somerset Electric Supply Co., Ltd., had increased the number of kWh supplied from 27,901,469 to 34,206,803, and paid its usual dividend of 7 per cent. The West Devon Electric Supply Co., Ltd., had generated 5,305,450 kWh as compared with 4,236,800 kWh in the previous year and had again paid a 5 per cent. dividend. At Aldeburgh the change of system reported last, year had been completed, and a bulk supply connection made with the neighbouring company, the East Suffolk Electricity Distribution Co., Ltd. Notwithstanding the disturbance and difficulty of working a mixed system throughout the year, the Aldeburgh Co. paid a dividend of 7 per cent. Owing to the continued growth of their general contracting business, especially around the Home Counties, their head office contracting department had been enlarged under the management of Mr. Tincknell, formerly manager of their Cullompton branch.

The Jerusalem Electric & Public Service Corporation reports a profit for the year ended March 31st of £P.65,056, as compared with £P.60,282 in the preceding year. From this the following allocations have been made:—Income-tax, £P.13,500; general reserve, £P.5,000; capital amortisation, £P.5,477; plant renewal and depreciation, £P.15,000. The dividend on the ordinary shares for the year is 7 per cent. (against 6 per cent.), and £P.5,087 is carried forward (against £P.4,228 brought in).

The Penarth Electric Lighting Co. reports a revenue for 1937 of £3,738, and after providing for general expenses, tax and debenture interest, a balance of £2,852, to which is added £6,166 brought in. The ordinary dividend is maintained at 7½ per cent. and £6,793 is carried forward. As from January 1st, 1937, the company, by arrangement, operated the undertaking on behalf of Penarth U.D.C. pending the completion of purchase which has taken place since the close of the year. Notice has been given to redeem £15,937 4½ per cent. first mortgage debenture stock on September 30th.

The Electrolytic Zinc Co. of Australasia has declared a dividend of 9 per cent. for the half-year ended June 30th on both preference and ordinary shares, making 15 per cent. for the year. In the previous year 17½ per cent. was paid, which included a bonus of 2½ per cent.

Philips' Incandescent Lamp Works Holding Co. reports a profit of 8,015,307 fl., as compared with 19,673,975 fl. for the previous year, and the ordinary dividend has been reduced from 18½ per cent. to 11 per cent. The report states that although the turnover for the year exceeded that of 1936-37, this was due entirely to an extremely favourable experience in the first six months. In the second half the company was affected acutely by world depression; currency depreciation, especially that of the French franc, involved heavy losses, and business was restricted by the action taken by many countries in strengthening existing measures for the protection of home markets.

The Bagdad Light & Power Co., Ltd.—Presiding at the annual meeting held on July 13th Sir William G. Max Muller (chairman) said that the company's business had continued to expand at a satisfactory rate during the year under review. The number of consumers connected had increased from 12,830 in 1936 to 14,607 in 1937, and the sales from 5,671,000 kWh to 6,863,000 kWh. At the request of the Minister of Economics and Communications, they had agreed, as from April 1st, 1938, to reduce the normal price of electricity from 25 fils to 20 fils per kWh on the understanding that no reduction in the rates was to be asked for before the end of the forthcoming period of five years—October 1st, 1943. The erection of the new boiler and new turbine had been completed and they had been put into operation. The result for the first four months of 1938 compared favourably with the corresponding months of last year.

Thomas Bolton & Sons report a gross profit for the year ended March 31st of £288,721, as compared with £232,871 in the preceding year, and after deducting administrative charges there is a balance of £218,994. From this the following deductions are made: Debenture interest, &c., £29,147; depreciation, £45,000; obsolescence reserve, £10,000; retirement compensation, £5,000; tax reserve, £10,000; general reseve, £20,000; N.D.C. reserve, £8,000; staff bonus, £7,000. The ordinary dividend for the year is 10 per cent. and £53,512 is carried forward.

The Anglo-Argentine Tramways Co., Ltd., reports gross receipts for the year ended December 31st, 1937, of £2,082,865, as compared with £1,903,595 in the preceding year. Expenses totalled £2,251,679, and transfer fees £369, leaving a deficit of £168,446. After providing for the annuity to the City of Buenos Ayres Tramways Co. (1904), Ltd., and debenture interest, there is a deficit for 1937 of £832,012, which, with the debit brought in of £2,763,153 makes the accumulated deficit £3,595,164. From this has to be deducted the balance on the exchange adjustment account, *i.e.*, difference on conversion of Argentine currency items into sterling (£328,697), leaving a debit balance of £3,266,466. Payments for the year in respect of debenture stock interest were suspended, and sinking fund cancelled under the terms of the moratoria granted on June 15th, 1937, and all arrears have since been cancelled under the scheme of arrangement sanctioned by the debenture stockholders on March 21st, 1938.

Petters, Ltd., report a net profit for the year ended March 31st of £19,580, as compared with £118 in the preceding year, to which is added £7,974 brought in. After providing for loss on realisation of investment in a subsidiary company, compensation payments on release of directors from service agreements, placing £2,300 to reserve for income-tax and the payment of the preference dividend, and interest on the funding certificates for the year to July 15th, 1938, there is a balance of £3,369 which is carried forward.

Davey Paxman & Co. (Colchester), Ltd., report a profit for the year 1937-38 of £22,073, as compared with £10,608 in the previous year, to which is added £6,477 brought in. After providing for tax, &c., and placing £1,000 to employés' benevolent fund and £1,848 to general reserve, it is proposed to pay a dividend of 15 per cent. for the year (against 7½ per cent. on smaller capital), and to carry forward £11,925.

Berry's Electric (1928), Ltd., reports a trading profit for the year ended March 31st of £35,389, as compared with £39,111 in the preceding year, to which is added interest on investments (£675) and £12,304 brought in. After deducting directors' fees £1,000), tax (£8,449), interest on 7½ per cent., convertible notes (£3,979), and loan interest (£504), there is a balance of £34,437. Reserve for leasehold premises receives £1,429, reserve for redemption of 7½ per cent. notes £5,000, and reserve for N.D.C. £1,500. It is proposed to pay a dividend of 4½ per cent. (against 6 per cent.) and to carry forward £20,163.

The Electrical Distribution of Yorkshire, Ltd., has declared an interim dividend of 4½ per cent., less tax (same).

The Telegraph Construction & Maintenance Co., Ltd., is maintaining its interim dividend at 5 per cent., less tax.

The London Electrical & General Trust is paying a final dividend of 3 per cent., making 5½ per cent. for the year (same).

The North Metropolitan Electric Power Supply Co. is paying an interim dividend of 4 per cent. Last year's interim was the same, but was paid on smaller capital.

The British Oxygen Co., Ltd.—The subscription list for the issue of £1,000,000 £1 5 per cent. cumulative preference shares, which was opened on Thursday last week, was closed on the same day, being heavily oversubscribed.

Edmundson's Electricity Corporation, Ltd., reports that the results of the operations of its group of companies during June, as compared with the corresponding month of 1937, show an increase of 6 per cent. in kWh sold.

Stocks and Shares

TUESDAY EVENING.

THE cheerfulness of Stock Exchange markets, to which reference was made last week, has undergone a slight check, while the volume of general business which was then gathering way, has also suffered to some extent The abounding bullishness of the Wall Street market was brought up with a sharp turn on what seemed to be a rush of selling on the part of people, some of whom wanted to take profits on shares which they had bought lower down, while others were glad to grasp the opportunity for accepting what seemed to be good prices for shares that they had been nursing through the protracted depression.

The cross-currents in United States industries are still very apparent. How to read the immediate prospect is baffling the most experienced minds. On the other side of the Atlantic, optimism, although much less vivid than it was a week or two ago, is subdued rather than defeated. No particular surprise would be felt if the bull party regained the upper hand.

Shares on Offer

The indisposition of the King led to prices of investment stocks and shares giving way, though not to any noticeable degree. As happens on every occasion when the Sovereign is indisposed, Stock Exchange markets reacted to the news and prices gave way, to recover later on. None of the prices, however, in the list of electricity supply shares experienced any setback.

It may be of service to set out a selection of ordinary £1 shares which, at the moment of writing, are on offer. It

will be noticed that the yield ranges from a little under 4 per cent. to a shade over 4½ per cent. on the money :—

Ordinary Shares.	Price. s. d.	Yield. £ s. d.
Clyde Valley Elec. Power	37 6	4 5 3
County of London Elec.	50 0	4 4 0
Lancashire Elec.	32 9	4 11 6
North-Eastern Elec.	33 9	4 3 0
North Metropolitan Elec.	48 6	4 2 6
Southern Areas Elec.	22 0	4 10 9
Yorkshire Elec. Power	41 0	3 18 0

The North Metropolitan Electric Power Supply Company has made a bid for the ordinary and preference shares in the Hendon Electric, and, the offer having been accepted by the holders of over 90 per cent. of the Hendon shares, it becomes operative. The North Metropolitan Electric Company has created the necessary amount of ordinary and preference stocks to meet the offer made to the Hendon Electric shareholders.

Home Electricity Supply

Metropolitan Electrics have risen once more to 50s. Improvements have occurred in Electric Supply, County of London, Midland Electric Power, North Easterns and Scottish Power. Edmundson ordinary are quoted ex rights, and, looking cheap in their new shape, were bought up to 27s. 9d., the equivalent of 41s. 3d. before the deduction. It is hoped that the dividend on the increased capital will be 6 per cent. : this would be the same as 9 per cent. on the old shares.

The June returns furnished to the Electricity Commissioners give an increase of 38 million kWh, generated by authorised undertakers in Great Britain, as compared with June last year, and this in spite of the fact that there was one working day less in last month than in June, 1937. The aggregate amount of electricity generated for the six months is 6½ per cent. greater than that recorded in the first half of 1937.

Callenders and Cromptons

Rumour has been running riot over the possible causes for a simultaneous rise in Crompton Parkinsons and Callender's Cable. The shares in both concerns came into pressing demand. Amalgamation, absorption, working agreement—these were the words with which report has conjured. Something more than mere gossip was assumed to be at the back of these guesses, and as official news may conceivably be published before the end of the week, no good purpose can be served by repetition here of the talk to which the matter has given rise. Speculation has played a lively part in the incident. Several dozens of bargains per business day are being done in the shares of both companies. British Insulated, it is interesting to observe, have also advanced and the price stands on common ground with Callenders at 4⅞.

Rises and Reactions

After their long fall, Ever Ready shares show a recovery which must be very welcome to holders who had been disquieted by weakness for which there seemed to be no tangible reason other than that of acute trade competition. The price of the shares at 20s. 9d. is 1s. 9d. higher. This compares with 17s. to which the price fell at the end of last month. Henleys, after a long period of quietude around 20s. are now 21s. 3d. The rise of 3s. 6d. in English Electric shares last week served to bring about a little selling, but the price kept fairly firm around 31s. Johnson & Phillips are 9d. better at 38s. 3d. Associated Electricals stiffened to 39s. On the other hand, Arons are dull; at 32s. 6d. the price is 2s. 6d. down. General Electrics rose to 79s. before going back to 77s. 6d. Telegraph Constructions, upon announcement of a 5 per cent. interim dividend, went up to 41s. 3d.

Victoria Falls

Victoria Falls and Transvaal Power Company publishes an excellent report and accounts. Increases in profit and in demand for current show very satisfactory expansion. The ordinary dividend is raised from 12 per cent. to 13½ per cent., the earnings on the ordinary being equal to over 24 per cent. The price of the shares rose a further 3s., to 70s., on the declaration. At the present quotation the yield is certainly modest. To-day's buyers justify their support by pointing to the unceasing development of mining areas, old and new, on the Rand and elsewhere, the majority of which pay tribute to the Victoria Falls Company by taking power from it.

Cable Stocks in Demand

The sharp rises which occurred last week in Cables and Wireless stocks have been carried further. The 5½ per cent. preference touched par before easing off to 98. Under the continued hope of the Spanish civil war coming to an early conclusion, speculative investment is looking for stocks and shares which may be expected to benefit from the outbreak of peace, as it is called; and, as Cables preference pays 5½ per cent. on the money, the stock is naturally one of those to which attention is directed. The oridnary at 54 is 1½ points up, and the income at 101 shows 10s. rise.

Globe Telegraph ordinary and preference have sympathised with the improvement in Cables and Wireless stocks, and are both 7s. 6d. higher. Great Northern Telegraph received impetus from Continental demand. At 37½ the price is 30s. to the good; Anglo-American Telegraph preferred strengthened to 108 and the deferred to 26 on the increased Transatlantic traffic due to the American market excitements. A fall of 3 points in American Telephone and Telegraph to 142½ reflects Wall Street's recent reaction, and to the same cause a drop back to 12⅞ in Brazilian Tractions must be attributed.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. Previous.	Last.	Price July 12.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	65/–	—	4 12 4
City of London	1	7½	7½	33/6	–	4 9 7
Clyde Valley	1	7	8	37/–	—	4 6 8
County of London	1	10½	10½	49/6	+6d.	4 4 7
Edmundson's 7% Pref.	1	7	7	32/6	+6d.	4 7 6
Do. Ord.	1	8	9	27/-xr.	—	—
Elec. Dis. Yorkshire	1	9	9	42/6	—	4 4 9
Elec. Fin. and Securities ...	1	12½	12½	50/–	—	5 0 0
Elec. Supply Corporation ...	1	11	12	53/9	+⅛	4 9 5
Lancs Light and Power ...	1	7½	7½	32/–	—	4 13 9
Lond. Assoc. Electric ...	1	—	7	30/–	–	4 13 4
London Electric	1	8	7	35/6	—	3 19 0
London Power Deb. Red. ...	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	12	50/–	+6d.	4 16 0
Midland Counties	1	7½	8	37/6	+6d.	4 5 –
Mid. Elec. Power	1	8	9	40/9	+9d.	4 8 5
North Eastern Electric Ordinary	1	7	7	33/–	+6d.	4 4 10
Do. 7% Pref.	1	7	7	33/–	+6d.	4 4 10
Northampton	1	10	10	46/3	—	4 6 7
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary ...	1	10	10	48/9	—	4 2 0
Do. do. 6% Pref.	1	6	6	29/6	—	4 1 4
Scottish Power	1	8	8	37/6	+6d.	4 5 4
South London	1	7	7	32/–	—	4 7 5
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	18/9	—	8 0 0
Yorkshire Elec.	1	8	8	40/6	—	3 19 9

PUBLIC BOARDS.

Central Electricity, 1950–70 ...	Stock	5	5	114	–	4 7 9
Do. 1955–75 ...	,,	5	5	116	—	4 6 2
Do. 1951–73 ...	,,	4½	4½	109	+1	4 2 7
Do. 1963–93 ...	,,	—	3½	100	+1	3 10 0
London Elec. Trans. Gtd.... ...	,,	—	2½	91	—	2 15 9
London & Home Counties, 1955–75	,,	4½	4½	112½	+½	4 0 1
London Passenger Transport, A...	,,	—	4½	117½	+1	3 16 6
Do. do. B...	,,	—	5	118½	—	4 4 5
Do. do. C...	,,	4	4½	76	+1	5 11 10
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$160	9	9	142½	–3	6 6 4
Anglo-Am. Tel. Pref.	Stock	6	6	108	+1	5 11 2
Do. Def.	,,	1½	1½	26	+1	5 15 5
Cable & Wireless 5½% Pref. ...	,,	4½	5½	98	+1	5 12 3
Do. Ord.	,,	—	4	54	+1½	7 8 2
Do. Income	,,	—	—	101	+½	3 19 1
Globe Tel. & Tel. Ord.	10	5½*	7½*	15⅛	+⅜	4 16 0
Do. do. Pref.	10	6	6	13⅛	+⅜	4 8 1
Great Northern Tel.	10	20	20	37½	+1½	5 6 8
Marconi-Marine	1	10	7½	26,3	—	5 14 3
Oriental Telephone Ord.	1	12*	12*	58/9	—	4 1 8

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	6/3	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	13	—	—
British Electric Traction Def. Ord.	,,	5	5	1025	—	—
Do. do. Pref. Ord.	,,	8	8	165	+5	4 17 0
Brazil Traction	$100	70 cts.	$1	12⅞	–1¼	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	100	—	5 0 0
Mexican Light Common	$100	Nil	Nil	1	—	—
Do. do. 1st Bonds	$500	5	5	30	—	—
Victoria Falls Ord.	1	12	13½	70/–	+3/–	3 17 2
West Riding	1	6½	10	35/–	+⅛	—

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	15	15	1⅛	–⅛	9 4 8
Assoc. Elec. Ord.	1	10	10	39/–	+6d.	5 2 7
Do. Pref....	1	8	8	36/6	—	4 7 6
Babcock & Wilcox	1	10	10	40/–	—	5 0 0
British Aluminium Ord.	1	10	12½	52/6	–6d.	4 15 4
British Insulated Ord.	Stock	20	20	4½	+½	4 4 2
Brush Ord....	,,	Nil	Nil	26½	—	—
Callenders'...	1	20	20	4½	+⅛	4 4 2
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord. ...	5/–	12½	12½	30/–	+⅛	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	10	12½	32/6	—	7 13 10
Enfield Cable Ord.	1	25	25	2½	—	—
English Electric	1	Nil	10	31/–	—	6 9 0
Do. do. Pref.	1	6½	6½	26/–	+6d.	5 0 0
Ericsson Tel.	5/–	25	25	41/3	—	3 0 6
Ever Ready	5/–	45	35	20/9	+1/9	8 8 2
Ferranti Pref.	1	7	7	27/6	—	5 2 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	17½	20	77/6	—	5 3 1
Henley's	5/–	15	20	21/3	+6d.	4 14 1
Do. 4½% Pref.	1	4½	4½	1⅛	–⅛	4 4 8
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	10	12½	38/3	+9d.	6 17 9
Lancashire Dynamo	1	20	25	57/6	—	8 13 8
Siemens Ord.	1	7½	7½	25/–	—	6 0 0
Telegraph Construction	£1	7½	10	41/3	+⅛	4 17 0

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

19530. "Apparatus for combined massage and electric treatment of the body." S. E. Wise. July 14th, 1937. (487216.)
24825. "Electric transformers." C. P. Boucher. September 20th, 1935. (487142.)
24869/70. "Production of cores for electric inductances." Steatit-Magnesia Akt. Ges. September 11th and 13th, 1935. (487143/4.)
30957. "High-pressure mercury vapour tubes." Quarzlampen Ges. November 13th, 1935. (487149.)
31010. "Scanning devices for television and like systems." Scophony, Ltd., and H. W. Lee. November 13th, 1936. (487318.)
31125. "Radio-goniometers." J. P. Jeffcock. November 14th, 1936. (487048.)
31209. "Electrical musical instruments." A. H. Midgley and A. M. Midgley. November 16th, 1936. (487220.)
31957. "Electric switches and plug-and-socket connections." C. H. Parsons, Ltd., and G. B. Handley, November 23rd. 1936. (487224.)
31958. "Electric switches and plug-and-socket connections. C. H. Parsons, Ltd., and G. B. Handley. November 23rd, 1936. (487225.)
33349. "Electric remote control systems." Vickers Armstrong, Ltd., and J. P. Watson. December 4th, 1936. (487226.)
34161. "Thermionic valve circuits." E. L. C. White. December 12th, 1936. (487321.)
34236. "Electric terminal block combined with cable clamp." T. Grocott and W. Grocott. December 14th, 1936. (486959.)
34283. "Electrical instruments of the time-integral of potential difference." General Electric Co., Ltd., and C. R. Dunham. December 14th, 1936. (487156.)
34307. "Apparatus for electrically measuring grain size range." A. E. O'Dell (Haardt & Co.Akt. Ges.). December 14th, 1936. (487232.)
34352. "Ultra-violet ray lamps." Allgemeine Elektricitats-Ges. and H. J. Spanner. December 30th, 1935. (487322.)
34376. "Projection screens for use in television, kinematography, telekinematography, or the like." Baird Television, Ltd., and J. L. Baird. December 15th, 1936. (487157.)
34438. "Radio transmission systems." Standard Telephones & Cables, Ltd., and C. E. Strong. December 15th, 1936. (487162.)
34439. "Modulating systems for radio transmitters." Standard Telephones & Cables, Ltd., and C. E. Strong. December 15th, 1936. (487163.)
34492. "Microphones, loud speakers, and the like." A. I. Abrahams. December 15th, 1936. (487381.)
34503. "Manufacture or production of electrical junction boxes." W. J. Garratt and H. Garratt. December 16th, 1936. (486966.)
34577. "Television transmission or the transmission of images." Radioakt. Ges. D. S. Loewe. December 16th, 1935. (487240.)
34578. "Cathode-ray tubes for intensity controlled illumination." Radioakt-Ges. D. S. Loewe. December 17th, 1935. (487241.)
34579. "Television amplifier." Radioakt-Ges. D. S. Loewe. December 17th, 1935. (487242.)
34580. "Method of and apparatus for television transmission." Radioakt-Ges. D. S. Loewe. December 18th, 1935. (487243.)
34619. "High-frequency energy transmission systems." Telefunken Ges. für Drahtlose Telegraphie. December 16th, 1935. (487248.)
34690. "Electron multipliers." Baird Television, Ltd., T. M. C. Lance, and G. E. G. Graham. December 17th, 1936. (487328.)
34691. "Electron-discharge devices." Baird Television, Ltd., and D. M. Johnstone. December 17th, 1936. (487329.)
34706. "Methods of heating working pieces by means of high-frequency furnaces." Allmänna Svenska Elektriska Aktiebolaget. December 18th, 1935. (487385.)
34861. "Multiple-contact electric sockets." British Mechanical Productions, Ltd., and S. T. Deakin. December 18th, 1936. (487063.)
34863. "Device for receiving and retransmitting signals in long-distance telephone lines." Soc. d'Applications Telephoniques. January 16th, 1935. (487339.)
34902. "Electric switches." British Mechanical Productions, Ltd., C. R. Cook and S. T. Deakin. December 18th, 1936. (487342.)
34905. "Telephone receivers." T. A. Behrens and Westinghouse Brake & Signal Co, Ltd. December 18th, 1936. (487343.)
34927. "Electric cables." Callender's Cable and Construction Co., Ltd., L. G. Brazier and G. M. Hamilton. December 19th, 1936. (486970.)
35183. "Photo-electric exposure meters." H. S. Macadie and Automatic Coil Winder and Electrical Equipment Co., Ltd. December 22nd, 1936. (487065.)

1937

158. "Alternating-current electromagnets." J. A. Crabtree and Co., Ltd. (F. Schiele, trading as Schiele Industriewerke). January 4th, 1937. (487068.)
3064. "Thermionic valves with filamentary cathodes." C. J. Smithells. M.O. Valve Co., Ltd. February 2nd. 1937. (487257.)
3594. "Means for rendering turn-button switches visible in the dark." W. Scheidegger. October 8th, 1936. (487076.)
3872. "Multi-contact electric switches having oscillatory action." Soc. Industrielle d'Instruments de Precision. February 14th, 1936. (487260.)
4771. "Remote-control systems for electric remote-control over power networks." W. F. Russell. February 17th, 1937. (487077.)
5225. "Electric convertors." General Electric Co., Ltd., and D. H. Donaldson. February 22nd, 1937. (487266.)
6580. "Thermionic valve amplifiers employing negative feedback." General Electric Co., Ltd., and L. I. Farren. March 5th, 1937. (487270.)
8172. "Electric transformer regulating systems." British Thomson-Houston Co., Ltd. March 20th, 1936. (Addition to 400962.) (487354.)
8038. "A.C. induction motors." English Electric Co., Ltd., L. Roberts and R. D. Ball. March 30th, 1937. (487172.)
9135. "Telephonic instruments." Control Instrument Co., Inc. April 10th, 1936. (487357.)
10288. "Prepayment meters for electricity." Landis and Gyr Akt.-Ges. October 9th, 1936. (487276.)
10959. "Suppression of arc-backs in electric converting systems employing arc-discharge devices." British Thomson-Houston Co., Ltd. April 16th, 1936. (487088.)
14877. "Scanning discs for television and like purpose." General Electric Co., Ltd., and D. C. Espley. May 28th, 1937. (487175.)
16152. "High-frequency transmitting arrangements." Marconi's Wireless Telegraph Co., Ltd. June 30th, 1936. (487282.)
16623. "Electrolytic devices." British Thomson-Houston Co., Ltd. June 16th, 1936. (487102.)
23929. "Reflecting electric incandescent lamps." Birdseye Electric Corporation. September 11th, 1936. (487011.)
24720. "Printing-telegraph apparatus." Creed and Co., Ltd. November 13th, 1936. (487291.)
26069. "Galvanic cell with air depolarisation." Pertrix Chemische Fabrik Akt.-Ges. August 14th, 1937. (487294.)
27225. "Metal bulb discharge tube and method for the manufacture thereof." Egyesult Izzolampa es Villamossagi. October 7th, 1936. (487197.)
27282. "Braun tubes." Zeiss Ikon Akt.-Ges. August 13th, 1937. (487372.)
27587. "Electric discharge devices." British Thomson-Houston Co., Ltd. October 20th, 1936. (487019.)
29009. "Electric light fittings." Zeiss Ikon Akt.-Ges. October 26th, 1936. (487122.)
30110. "Wireless receivers and housings therefor." Telefunken Ges für Drahtlose Telegraphie. November 3rd, 1936. (487125.)
30653. "Holders for thermionic valves and like devices." Plessey Co., Ltd., H. Da Costa and P. J. Packman. November 8th, 1937. (487027.)
31395. "Navigation-aiding radio systems." Telefunken Ges für Drahtlose Telegraphie. November 14th, 1936. (487302.)
31677. "Indicators particularly for radio apparatus." Marconi's Wireless Telegraph Co., Ltd. November 17th, 1936. (487128.)
32779. "Electric time-registering apparatus." British Thomson-Houston Co., Ltd. November 27th, 1936. (487129.)
32785. "Control arrangements for electric motors, operating machine tools, and similar machines." J. E. Pollak (Pittler Werkzeugmaschinenfabrik Akt.-Ges.) November 27th, 1937. (487029.)
34277. "Electric cooking plates." British Thomson-Houston Co., Ltd. December 11th, 1936. (487310.)

1938

1325. "Lighting fittings." British Thomson-Houston Co., Ltd. January 15th, 1937. (487039.)
4067. "Frequency-changing arrangements and electric discharge tubes for use therein." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 12th, 1937. (487044.)
4238. "Electrolytic condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 13th, 1937. (487045.)

Trade Mark Applications

The following are among the latest applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 6th:—

Lissen—Lissen at Home To-night (lettering and design). No. 585154. Class 8. Instruments and apparatus for use in wireless telephony.—Lissen, Ltd., Angel Road, Edmonton, N.18.

Hecla. No. 584164. Class 11. Electric radiation apparatus for therapeutical purposes, X-ray apparatus and electric batteries for curative purposes.—Kooperativa Forbundeb, Forering, Stockholm, Sweden (British representatives: J. E. Evans-Jackson & Co., 57-60, Holborn Viaduct, E.C.1).

Vactite, with name and address of company (lettering and design). No. 584633. Class 13. Metal goods.—Vactite Wire Co., Ltd., 7, Fortune Street, Golden Lane, E.C.1.

Marine Engineers

A new system of examinations for first- and second-class certificates for engineers in the mercantile marine will come into force in September. In order to avoid interfering with arrangements already made, however, the present system will continue, alternatively, until further notice. The two papers now known as the "practical mathematics test" will be divided into four, one of which will deal with electro-technology, and candidates must obtain a minimum number of marks in each paper. The examination will be divided into two parts, electrical subjects falling in Part B. The revision of the system follows the recommendations made by a Departmental Committee. Examinations of Engineers in the Mercantile Marine and further particulars are given in Board of Trade Notice No. M.162. Details of the syllabuses recommended are contained in an Appendix to the Report of the Departmental Committee (Stationery Office, 1s.).

Lifting Apparatus

Two statutory orders have been issued relating to registers required to be kept under the Factories Act, 1937. No. 599 concerns all chains, ropes or lifting tackle (except fibre-rope slings) and No. 600 concerns the examination of cranes and other lifting machines. These are obtainable at 1d. each from the Stationery Office.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Annexe to Aberdeen Maternity Hospital (£28,000); burgh surveyor.

Aberystwyth.—Houses (80); borough surveyor.

Alfreton.—Houses (44), Somercotes; U.D.C. surveyor.

Banbury.—Additions to Infectious Diseases Hospital; borough surveyor.

Barking.—Extensions to factory, Alfred's Way, for Invicta Foil Co., Ltd., 101, Leadenhall Street, E.C.3.

Barnsley.—Houses (58), Burton Road, and bungalows, Carlton estate; borough engineer. Extension to foundry, Pontefract Road; Needham Bros. & Brown, Ltd.

Barrow-in-Furness.—Houses (12), Laburnum Crescent; J. H. Sharp, Ltd. Houses (136) and flats, Greengate estate; borough engineer.

Batley.—Houses (108), Dark Lane estate; borough engineer.

Birkenhead.—Houses (314) and shops, Wood Lane and Saughall Massie Road; Park Estates (Wirral), Ltd. Nurses' home; borough engineer.

Birmingham.—Premises, New John Street, for W. Bulpitt & Sons, Ltd. Extensions to factory, for Dowdy & Mill, Ltd., Camp Hill; C. Nokes & Son, contractors, 67, Sandhurst Avenue, Stechford.

Blackburn.—Houses (34), North Park Avenue; E. Mercer & Son, builders, Richmond Hill.

Blackpool.—Houses (14), Henson Avenue; Yates & Walsh.

Bolton.—Houses (70), Kay Street; housing director, Westminster Bank Chambers, Old Hall Street North.

Brandon.—Houses (156); U.D.C. surveyor.

Brighouse.—Houses (22), Garden Road; Brighouse Estate Co., Ltd., Huddersfield Road.

Bristol.—Homes for aged (£87,992); C. A. Hayes & Sons, Ltd.

Bromborough.—Houses (380), New Chester Road; T. Fogg & Son, architects, 10, Dale Street, Liverpool.

Cheltenham.—Houses and two blocks of flats, Whaddon estate; borough engineer.

Cheshire.—School, Balfour Road, Runcorn, for the E.C.; F. Anstead Browne, county architect, The Castle, Chester.

Coventry.—Houses (300), Edgewick Park estate; Bayliss Bros., Court House Green.

Croydon.—Extensions and buildings, Warlingham Park Hospital, Upper Warlingham, for Visiting Committee; E. Taberner, clerk, Town Hall, Croydon.

Dagenham.—Swimming bath and hall (£27,832), Old Dagenham Park; Walter Lawrence & Son, Ltd., contractors, Sun Street, London, E.C.2.

Devonshire.—School, Newton Abbott (£27,053) for County E.C., Exeter.

East Ham.—Additions to Cairn mills, Silvertown; Loders & Nucoline.

Edmonton.—Houses (354), Hoe Lane estate; borough engineer.

Enfield.—Flats (250), Bullsmoor estate; U.D.C. surveyor. Alterations to Rialto Cinema, Burleigh Way; Gaumont British Picture Corporation, Ltd.

Folkestone.—Houses (96), Cheriton; borough engineer.

Friern Barnet.—Municipal offices, depot, &c. (£41,181), for U.D.C.; Raglan Building Co., Ltd., contractors, Wembley Park.

Gloucester.—Technical college (£80,000), for T.C.; W. J. B. Halls, contractors, Barton Gates.

Grangemouth.—Reconstruction of Town Hall; Wilson & Wilson, architects.

Hastings.—Development of Torfield estate, Old London Road; Fryer & Sons. Extensions to High School for Girls; H. W. Caston, quantity surveyor.

Hoyland Nether.—Houses (74), Stead Lane; U.D.C. surveyor.

Huyton.—Dwellings (100), Boundary House estate; A. W. Thomas, U.D.C. surveyor, Council Offices, Derby Road, near Liverpool.

Ilford.—Extensions to Isolation hospital (£13,311); J. Roger Preston, consulting engineer, Dilke House, Malet Street, W.C.1. Modernisation of Mount Central and Uphall schools (£9,153), for the E.C.

Ilkeston.—Houses (56), Oakwell estate; J. E. Mitchell & Sons. Shops, South Street; Ritz Cinema, Ltd.

Keighley.—Houses (27), Mitchell Street; Thomson & Sunderland. Extensions to Town Hall; borough engineer.

Kidsgrove.—Houses (134), Talke Pits; U.D.C. surveyor.

London.—(FOREST HILL).—Shops and flats, Dartmouth Road; R. H. Brine, 20, The Grove, Edgware. (WOOLWICH).—Tenements, Barnfield Road (£15,250); Gee, Walker & Slater, Ltd.

Loughborough.—Houses (40), Ling Farm estate; Barry Parker, architect, Norton Way, Letchworth.

Louth.—Houses (30), Brackenbury Road, Keddington Road; borough surveyor.

Manchester.—Cinema at the corner of Oxford Street and Portland Street, for Chepstow Development Co.

Market Drayton (SHROPSHIRE).—Police station (£12,370); county architect.

Mexborough.—Baths; U.D.C. surveyor.

Middlesbrough.—Theatre for Middlesbrough Little Theatre (£9,000); Kitching & Co., architects, 21, Albert Road.

Northampton.—Houses, Duston, Rothersthorpe, Denton and Road; R. J. Miller, R.D.C. surveyor.

Oldbury.—Houses (28), Hurst Green; W. Parkes. Houses (58), Park Avenue; Walker & Son. Houses (48), Tinkers Farm estate; S. H. Rowe. Houses (54), Wood Norton Road; C. McWhirter.

Ponders End.—Extension to factory, Duck Lees Lane; A. H. Maxfield & Son.

Portsmouth.—Houses (26), Ayles Road, Copnor; Elson Ideal Homes, Ltd. Baths, Victoria Park (£55,912); H. E. Pitt, Ltd.

Preston.—Cinema, Ashton-on-Ribble; Teasdale & Sunter, architects, St. Mary's Parsonage, Manchester.

Rochdale.—Extensions to market (£16,450); borough engineer.

Rochester.—Fire station, Corporation Street (£27,750); city surveyor.

Rotherham.—Houses (96), Bent Lathes Avenue; P. Parkin. Houses (130), Council estate; O. Weaver. Extensions to Alma Road Hospital (£19,000); borough engineer. Shops and offices, fronting Corporation Street and Market Street (£34,600), with electrical work; R. H. Knowles & Son, Ltd., builders.

Rowley Regis.—Houses (21), Dudley Road and Brades Road. Tividale, for C. Birks. Houses (35) and shops near Grostey Hill, Blackheath; J. Harper & Sons, Blackheath, Ltd., Blackheath, Birmingham. Extensions to Beeches Road schools; Pritchard, Godwin & Clist, architects, Bank Buildings, Kidderminster.

St. Ives.—Town hall (£14,000); borough surveyor.

Scarborough.—Bus station, with offices and waiting rooms, Northway, for the West Yorkshire Road Car Co., Ltd., Harrogate.

Sheffield.—Houses (200), Mansfield Road, Holly Bank Road and Normanton Hill; A. E. Clayton, 27, Abbeydale Park Crescent. Houses (60), near Norden Avenue; A. Smith, Denton & Co., Hartshead. Houses (20) and garages, High Storrs Drive and High Storrs Road; A. Shaw, 181, High Storrs Road. Flats (78), garages, &c., Fulwood Road; A. Krausz, 9, Wilkinson Street. Extensions to premises, Archer Road Millhouses (£50,000), for the Archer Engineering Co., Ltd.

South Moor (Co. DURHAM).—Premises for the Excelsior Club and Institute; H. A. Curry, architect, 3, Church Bank, Stanley.

Stockton-on-Tees.—Premises for Doggarts, Ltd., High Street; G. Lazenby & Son, builders, Ferryhill, Co. Durham.

Stoke-on-Trent.—Houses (252), adjoining Townsend site, Bucknall; C. Cornes & Son, Lichfield Street, Hanley. School, Carmountside (£28,912), for the E.C.

Stretford.—Factory and offices, Westinghouse Road; Trafford Park Chemical Co., Ltd.

Suffolk.—Extensions to Wickham Market Area school (£21,009), for the East Suffolk E.C.; county architect.

Sunderland.—Houses, Grindon; W. and T. R. Milburn, architects, 17, Fawcett Street.

Tipton (STAFFORDSHIRE).—Houses (112), Upper Church Lane estate, Section 1; C. R. Gallie, housing director, Municipal Buildings.

Torquay.—Police station and court, South Street, for the Devonshire C.C. Extensions to Isolation hospital (£14,584); Building and Public Works Construction Co., Ltd.

Uxbridge.—Houses (54), Church Lane; U.D.C. surveyor. Houses (38), Goulds Green, Hillingdon; R. T. Warren.

Wallsend-on-Tyne.—Houses (104), King's Road; W. Leech.

Walsall.—Houses (39), Coalpool estate; Sabin & Young, Ltd.

Wembley.—Four factories, Mount Pleasant, Alperton; Abbey Estates Development Co., Park Royal Road, N.W.10.

West Ham.—Dwellings (44), Stratford; borough engineer.

West Hartlepool.—Houses (30), Parton and Hart Streets, and bus garage, Musgrave Street, for the T.C.; borough engineer.

Weymouth.—Cinema, King Street, for Odeon Theatres, Ltd.

Whitefield.—Houses (82), Moss Lane; U.D.C. surveyor.

Worsley.—Houses (81), East Lancashire Road; J. Massey, builder, 110, Buckley Lane, Farnworth. Houses (24), Warwick Avenue; W. H. Hardman, builder, Clifton Drive, Swinton.

Worthing.—Houses (50), Compton Avenue; West Sussex Coast Development, Ltd. Houses (15), Ham Way; G. Baker & Son.

Yorkshire.—School for Girls, Richmond, for the North Riding C.C.; George Dougill & Son, builders, Chestnut Street, Darlington. School, Thornaby-on-Tees, for the North Riding C.C.; county architect, Northallerton. Extensions to Sowerby Bridge secondary school (£14,000); West Riding county architect, Wakefield.

Sub-station Construction

AMONG new sub-stations planned are the following:—Outram Street, Stockton-on-Tees, for the Town Council; The Broadway, Sunderland, for the North-Eastern Electric Supply Co., Ltd.; and Hawtonville estate, Newark-on-Trent, for the Corporation. At Barrow-in-Furness the electrical engineer has reported that a considerable amount of damage has been done, particularly to the switchgear at the Cartmel sub-station, by a violent thunderstorm, and he has been authorised to put down a new kiosk at Cartmel immediately at an estimated cost of £800. The Eccles Electricity Committee reports that in order to deal with the increased load during next winter the Lancashire Electric Power Co. has agreed to double the transformer capacity at the Mount Street sub-station by installing two additional 5,000 kVA transformers for stepping down the incoming supply from 33 kV to 6.6 kV. The Central Electricity Board propose to purchase the Berg field, near The Ridge, Hastings, for a transforming station. The East Ham Electricity Committee is to erect a sub-station at the new London Electron Works and alter two sub-stations at a cost of £2,261. Sanction is being sought by the Ilford Electricity Committee to borrow £6,834 for the Grove Road sub-station and £8,290 for the Uphall sub-station, while it is proposed to erect a sub-station in Hall Road, Ilford, at a cost of £1,377.